AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XLII
Number 11

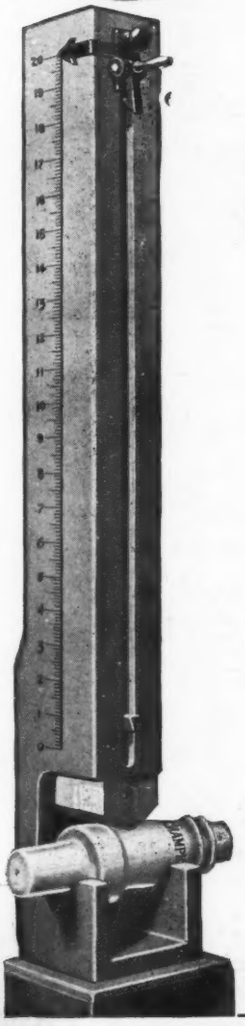
PUBLISHED WEEKLY AT 239 WEST 39TH STREET
NEW YORK, MARCH 11, 1920

Twenty cents a copy
Three dollars a year

GENERAL LIBRARY
MAR 20 1920
Engineering Library

CHAMPION TRADE MARK

Champion Dependable Spark Plugs



2½ Times Stronger

HOW many plugs were broken in your plant last year because a wrench slipped?

Champion "3450" Insulator is 2½ times as strong as the best previous material.

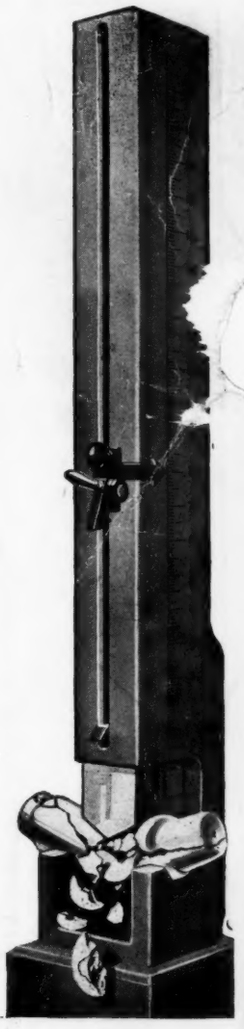
This high resistance to breaking, cracking or splitting was developed in Champion Spark Plugs by three thousand four hundred and fifty experiments, representing ten years of effort.

Engineers know that faulty functioning of the spark plugs causes unwarranted dissatisfaction with other parts of the car.

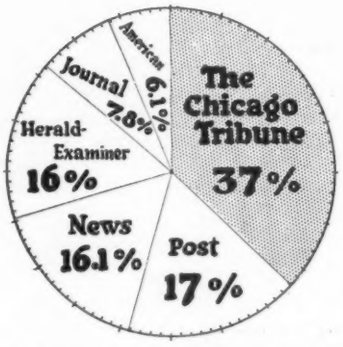
Specify Champion—the plug with a Factor of Safety.

Champion Spark Plug Company
Toledo, Ohio

Champion Spark Plug Company, of Canada, Ltd., Windsor, Ont.



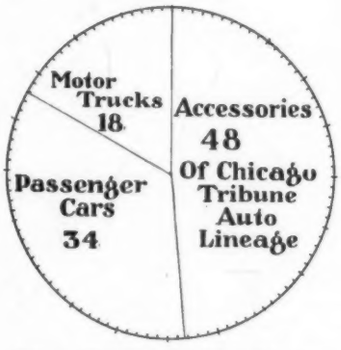
Inside Facts On The Division Of Motor Advertising In Chicago



Motor Lineage All Papers, 1919

Here is a chart which pictures the composite judgment of motor advertisers in placing business in Chicago newspapers. You can see at a glance what proportion of the total lineage was carried by each paper during 1919. Figured on a basis of money spent, The Tribune's leadership would be even greater, since its rate is much higher than that of any other Chicago newsapper.

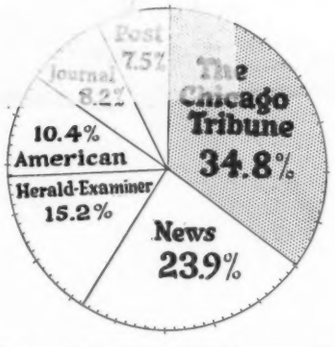
Tail Almost Wags the Dog



What Chicago Tribune Lineage Consists of

The chart opposite shows the percentage of Chicago Tribune motor advertising utilized by each of the three named sub-classifications. The space devoted to articles used in and on cars is almost equal in volume to that used for the cars and trucks themselves. This business news of tires, spark plugs, carburetors, oil, etc., gives variety to the advertising columns of The Chicago Tribune and sustains the interest of motorists.

Unique Position of The Chicago Tribune



Total Advertising All Papers, 1919

The first chart above pictures The Chicago Tribune as printing 37% of the total motor advertising in Chicago. The chart opposite shows that The Tribune prints 34.8% of all advertising—display and classified, local and national. Note that The Tribune carried more than the two leading evening papers combined. The prestige of The Tribune, together with the circulation of 400,000 Daily and 750,000 Sunday, makes it the dominating factor in the Chicago field.

The Chicago Tribune

THE WORLD'S GREATEST NEWSPAPER

The Charts On This Page Are Typical Of The Scores Of Graphs and Maps In The Chicago Tribune's 1920 Book Of Facts, Which Will Be Mailed Free If Requested on Business Stationery.

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XLII NEW YORK—THURSDAY, MARCH 11, 1920 NO. 11

Aircraft Makers Exhibit the 1920 Commercial Models

The war was forgotten in staging the second national show of the Manufacturers' Aircraft Association, only models suited to industrial purposes being shown. The advancement of airplane construction in America and its future development, in addition to descriptions of the various models on exhibition, form the basis of this article.

New York, March 8.

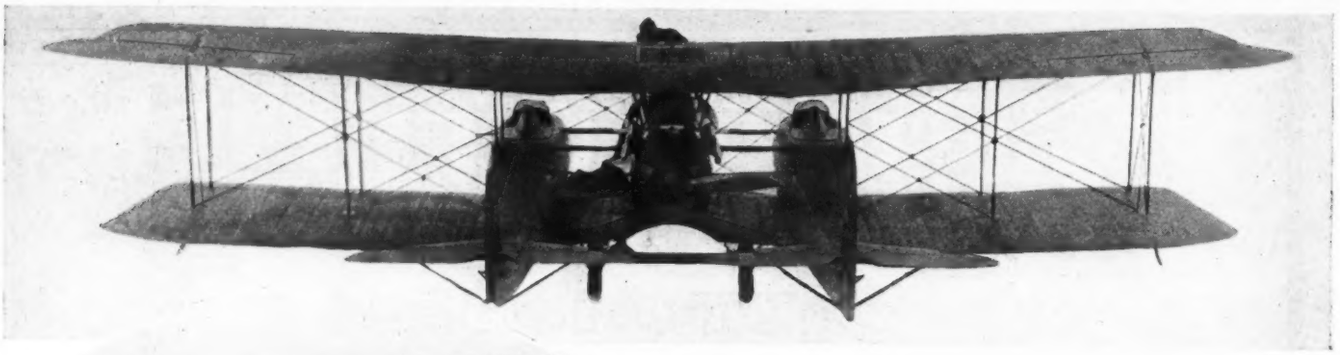
THE second national show of the Manufacturers' Aircraft Association, depicting the year's commercial development of airplanes and dirigibles, opened in the armory here of the Seventy-first Regiment on March 6, and will continue throughout this week. No military models were shown; the entire exhibit was devoted to the peace-time building of both heavier-than-air and lighter-than-air vehicles.

Several factors of interest to the automotive industry were outstanding features of the show. The first of these was the fact that the airplane has found a commercial field and that the building of airships has not ceased with the completion of the Army and Navy program evolved during the period of hostilities. The aim of the showing was to prove that the construction of planes and balloons had become an industry that could look to the civilian population for at least a measure of support.

In other words, whereas the show of 1919 was largely to display to an interested crowd of exhibitors the progress that had been made in building for military purposes, the exhibit of 1920 took on the characteristics somewhat of the present-day motor car show. Salesmen sought for prospects and builders were expectant that these civilian prospects would furnish them the means of carrying their factories through the financial pathways of the coming year.

From the talk of the salesmen and the aspect of the exhibits themselves, a visitor might easily have obtained the impression that such business had grown to large volume and that the coming year was an assured one for the manufacturers. However, such a view probably is over-optimistic. Many of the companies have come through their first after-hostilities year in a more or less sound financial condition, and others seem to see their way clear for a continuation of that success during 1920. But the civilian use of planes, for purposes of carrying freight and passengers, is yet in the experimental stage, its future dependent upon many things.

Much Government work was carried on during the year just past, and some is now under way that will carry well into 1920. One and perhaps two firms have built up a strong sales force, with distributers, sales agents, service stations and landing fields, represent-



The Thomas-Morse Mail Plane

This machine, with two engines, one mounted in the front as a tractor and one in the rear as a pusher, in the center nacelle, was one of the outstanding engineering features of the show. Its many interesting features are described in the accompanying article These pictures show a front and rear view.

ing an outlay of missionary work that may bear good fruit in the coming months. Other companies are looking forward with an optimism that should carry them well ahead, although some of them expect this year to be a more critical one than that just finished, being dependent, as is expected, more upon civilian than Government support.

The work during last year of putting the plants on a basis of commercial production has been gratifying. Each of the companies exhibiting—their number, unfortunately, being smaller than that of 1919—had ships well adapted for non-military use, most of them designed along lines of comfort and practicability. Much work has been done in converting Army or Navy planes into well-furnished and well-finished transport or freight carriage machines. No "freakish" development was encountered, and it was evident that the makers have gone carefully into the business of making the airplane a capable and sturdy carrier.

The New York show, in many respects, was similar to that recently held at Chicago, the various features of which were described in AUTOMOTIVE INDUSTRIES of January 22. Curtiss exhibited the same machines, an improved Eagle being shown here, however. The Aeromarine company showed one additional model here and Dayton-Wright made similar displays at both places. L-W-F, which had a ten-ton freighter and a diminutive model here, did not show at Chicago, that also being true of Ordnance, West Virginia, Thomas-Morse and several other companies that were represented here either by models or by engines alone. The Interallied Aircraft Corp., United Aircraft, Inc., and the American Aircraft & Supply Works exhibited only at Chicago.

The exhibitors here were the following:

The Thomas-Morse Aircraft Corp., Ithaca, N. Y.

The Dayton-Wright Division of the General Motors Corp., Dayton, Ohio.

The Ordnance Engineering Corp., New York.

Curtiss Aeroplane & Motor Corp., New York.

L-W-F Engineering Corp., College Point, L. I.

Aeromarine Plane & Motor Corp., New York.

Goodyear Tire & Rubber Co., Akron, Ohio.

West Virginia Aircraft Corp., Wheeling, W. Va.

In addition to these companies, all of which exhibited completed machines, the Glenn L. Martin Co. of Cleveland, Ohio, and the Gallaudet Aircraft Corp. of New York, exhibited models or pictures of their planes. The Ace, a new machine of small size, and the British Bristols were exhibited at hotels near the armory. Several manufacturers were not in evidence, notably Loening. The accessory field was rather large, a number of engines being shown, principally the Wright-Hispano, the Packard, the Lawrence and the Beecher, the latter an eight-cylinder opposed air-cooled engine made at New Haven, Conn. Instrument, wire, fabric, varnish and similar exhibits filled the remainder of the exhibit space.

From an engineering standpoint, interest was large in the new mail plane of the Thomas-Morse company. This machine was of the two-fuselage and center nacelle type, with the nacelle carrying two 300-hp. Wright-Hispano engines, one mounted in front and one in the rear. A more detailed description will be given later in this article, but among its salient points are the following:

High ratio of plane weight and useful load, the latter being almost as much as the former.

The small wing weight. Including struts and wires, this was stated to be 0.9 lb., in contrast with a customary weight of from 1.1 to 1.5 lb.

The extremely large wheels, affording easy landing on rough ground, or affording a "snow-shoe" effect on soft ground.

The light landing gear.

The strut fittings.

The high power, the machine being able to remain in flight with one engine off and capable of taking off under the same conditions.

The engine mounting.

All of the features of this machine were said to mark it as one of the most notable aviation achievements of the year. Four of this type are under construction for the aerial mail service and comprehensive flight tests already have been made at Ithaca, N. Y.

Interest also was large about the new machines of the L-W-F company, both of which also will be described. These consisted of a ten-ton freighter and a small monoplane, having an empty weight of less than 600 lb. The latter was the only plane under exhibit that mounted an air-cooled engine, using the Cato two-cylinder opposed, although the Ordnance company showed a model equipped with an Anzani air-cooled plant. Like the small L-W-F plane, the Ordnance model was a monoplane, but was designed to seat two passengers. The engine was rated at 50 hp., the wing span being 30 ft. and the sale price fixed at $4,500.

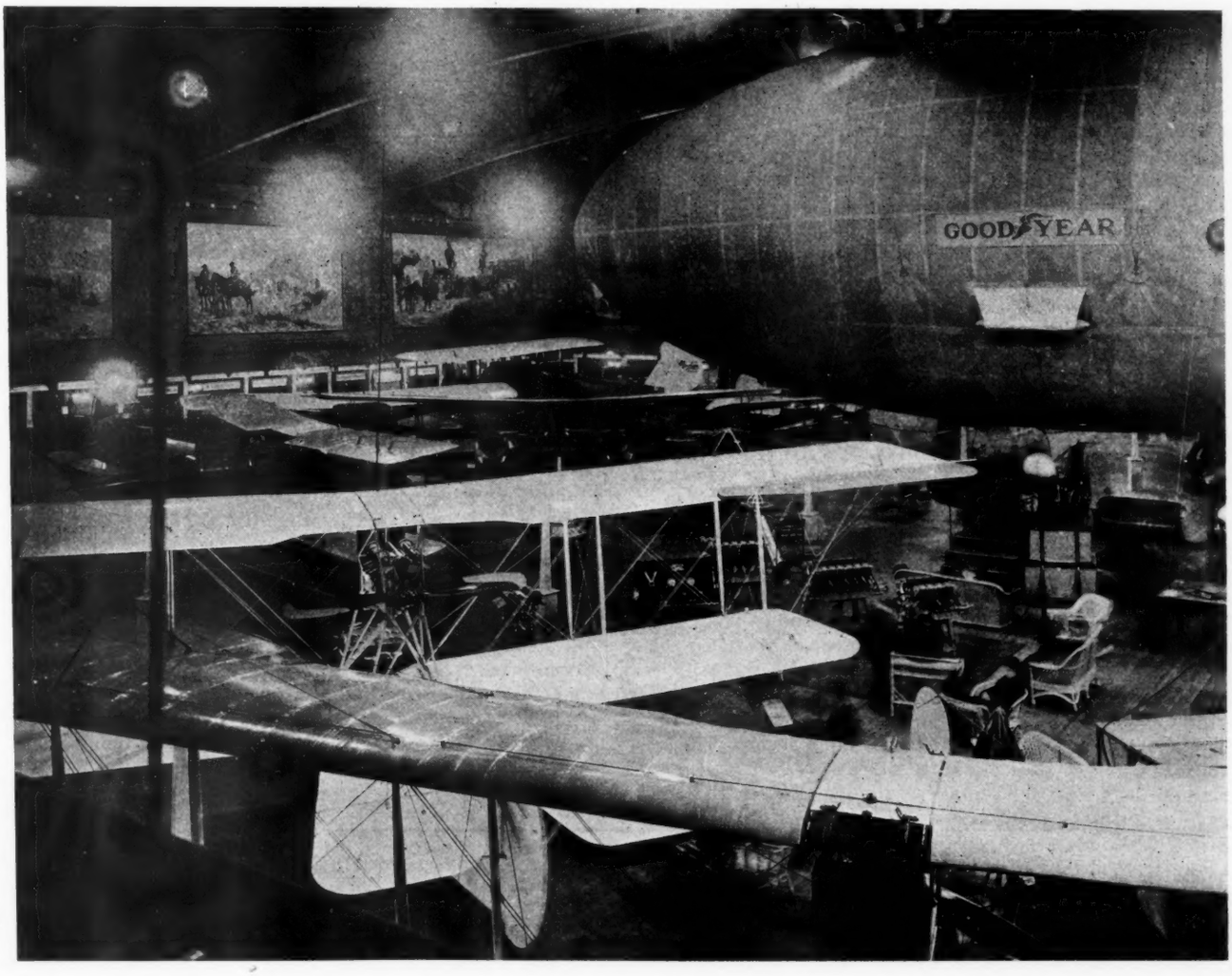
The largest exhibits were the Curtiss and the Aeromarine, both of which were similar to those at Chicago. In addition to the 50-B-2 flying boat of the latter company, which was shown at Chicago, the company displayed a model No. 40, seating only two passengers and being equipped with a six-cylinder instead of an eight-cylinder engine. Another model hull also was shown, in which the two passengers sat in an enclosed cabin, with the pilot outside in the bow. Aeromarine featured the commodious fittings of their models, a tendency that was noted throughout the exhibits.

This tendency in present construction is similar to that taking place in Europe, and shows the strides being made by manufacturers to overtake the commercial field. Makers are adopting automobile terms, as well as automobile fittings, for their models, coupé, sedan, limousine and similar nomenclature being heard throughout.

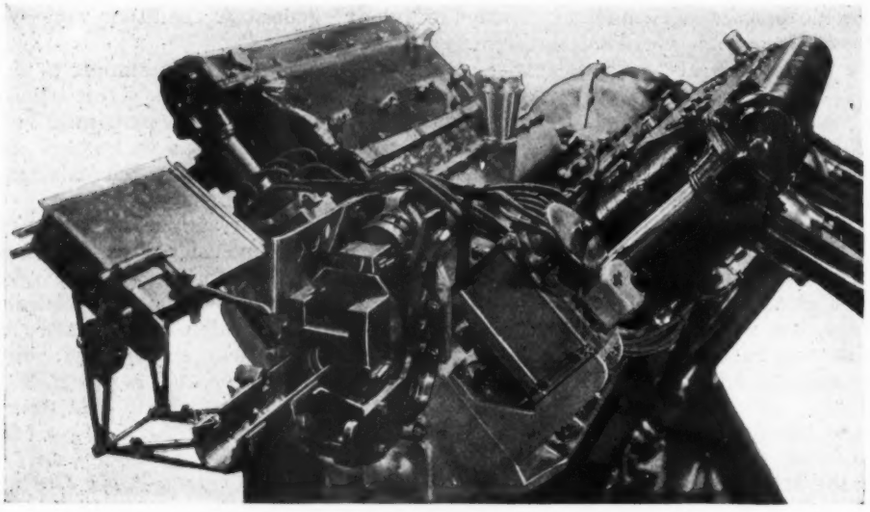
Development during the past year, as shown by the exhibits, has largely been along conventional lines; refinement of fittings going on apace with an apparent tendency for higher power and enlarged capacities. Nothing was on the floor that exhibited freakish lines. Construction remained of the biplane type, no triplanes being shown, and the monoplanes being confined to the L-W-F and the Ordnance companies. Engines, with few exceptions, were stationary and water-cooled, this feature having been influenced, perhaps, by the great amount of work that was done during the war on the Liberty. Curtiss, Wright-Hispano and Liberty engines were predominant as to number actually shown.

Four engines were shown or listed that departed from the stationary and water-cooled type. These were the Cato, used in the L-W-F, the Lawrence three-cylinder

Showing the 1920 Aircraft



One section of the Seventy-first Regiment Armory at New York, which houses the year's exhibition of the Manufacturers' Aircraft Association



The mounting of the 37-mm. cannon firing 20 shots per minute, on the K Wright-Hispano engine. This shows the breech of the gun and the rear of the engine. The barrel goes forward through the engine and propeller. This is an adaptation of a French idea used by a few of the leading French fliers

radial engine that is stationary and air-cooled, the Anzani listed for a model of the Ordnance, and the Beecher, eight-cylinder, opposed stationary, air-cooled plant, already mentioned.

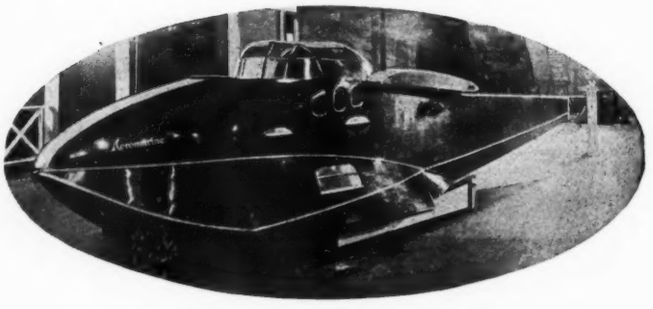
Some wonder was expressed that the American manufacturers had scarcely touched the air-cooled and the radial and rotary types. Nothing was shown to match the outpouring of such machines that marked the recent Paris exhibition. Some pilots spoke of the more or less fixity of the American type of engine in deprecatory tones, while others seemed to think this factor was good, explaining that the European makers had seen the advantages of the stationary, water-cooled engine, and were powering many of their larger planes with it, giving up the other types. The development of the automobile engine was said by some to supplement the experience of aircraft manufacturers in believing the American practice to be the more valuable.

However, it cannot be said that this problem is much nearer a solution, for America, at least, than it was a year ago. Most of the plane makers have been so thoroughly occupied with the problem of getting into peace-time construction, of seeing their way ahead commercially and even of continuing in business, in some cases, that they have had little opportunity to experiment with radical departures from their war construction. They have redesigned fuselages and nacelles, powered their engines higher and enlarged wing surfaces to make their planes of greater commercial value, but basic principles—such as engine type—remain much the same.

This may not continue during the coming year, as some talk was heard of pending changes and of engine experiments that may be made. Goodyear, for instance, may have within a month or so a new "baby blimp," using one of the Lawrence three-cylinder engines. But it was not understood the Goodyear has deserted the water-cooled engine, such as was used on the bag shown here, and the change is not necessarily permanent.

From this, it may be inferred that the American makers are evolving a more or less standardized type of plane, characteristics in most instances being similar. That is true to a certain extent. Some of the exhibits seemed so much alike, except, perhaps, in fittings, that the manufacturers' names might have been switched and few of the visitors would have known who was the maker. Others, of course, were distinctive, discounting the variety of models.

But, whatever may be said in that connection, it was shown that American makers have developed planes in keeping with the idea of capable construction. Few, if any, of the machines will fail to fulfill the tasks for which they are built. This may not be for speed, or for exceptionally long flights, considering only the ones on exhibition, but they may be expected to meet the needs, with a minimum of loss and accident, of the commercial pursuits to which they should be put. Spectacular appearance and



An Aeromarine hull, the two passengers being seated in the enclosed space while the pilot is outside in the front

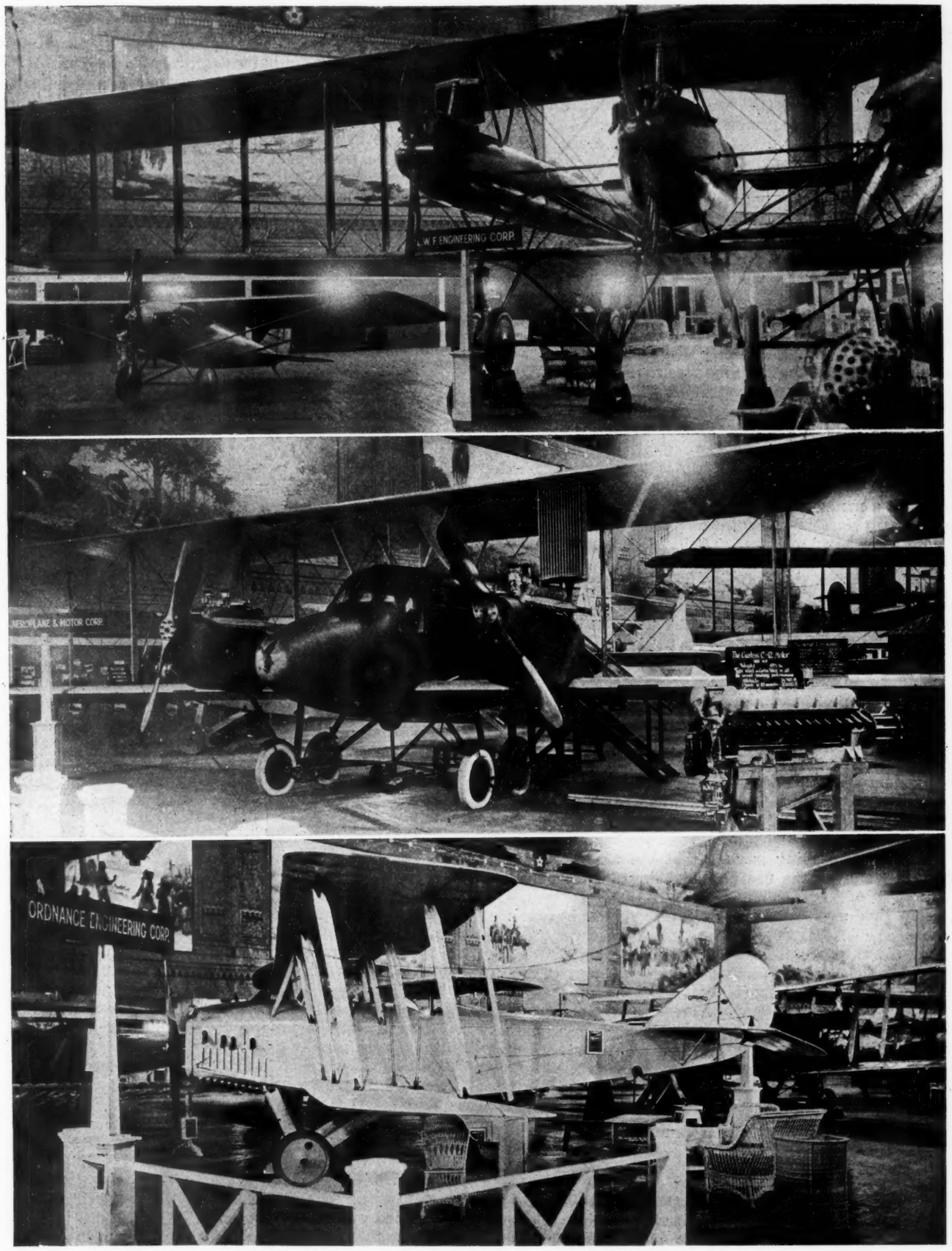
spectacular performance, it seems, have not been the goal sought after; rather, it might be said, the effort has been made to obtain a plane that could command continuing markets.

That is another way of saying that war purposes were little in evidence, although the Army and Navy both had interesting exhibits of radio, telephone and similar equipment. The tone of the show was commercial. The war has ended and the makers are facing the problem of doing business on a peace-time basis; at least, they are endeavoring to continue their operations. It is true that some of the plants are yet depending largely upon Government orders, such as overhauling Army DeHavilands, or building for the postal service, but some of them believe the way is clear for a simon pure commercial future, the plants being devoted to the construction of machines for sale to private firms and individuals. Some dissatisfaction was expressed by the delay of the Federal Government in determining its attitude in regard to civil aviation, but other companies, notably one of the largest, expressed itself, through its sales manager, as being entirely satisfied with the outlook.

The Curtiss Exhibit

CURTISS featured the same models that were on exhibit at the recent Chicago show, including the Eagle, Oriole, Seagull and Standard, the only change being that the Eagle has become a two-engined, instead of a three-engined machine, and enlarged so that its carrying capacity has been increased from eight to ten passengers. The machine otherwise has been refined and stands today, according to the makers, as being more reliable me-

New Models at the New York Aircraft Show



Upper—The L-W-F mail freighter and the diminutive monoplane. Center—The re-designed Curtiss "Eagle," having two instead of three engines; showing also at the right the new C-12 engine. Lower—Sport plane of the Ordnance Engineering Corp.

chanically and, through the enlargement of the cabin space, offering greater opportunities for commercial service. An interesting phase of the Eagle development was the recent statement from the Curtiss sales force that maximum production of this machine was assured for 1920 through orders already booked and that the big plane was being built at a rate of one monthly.

The change to two engines has been made by eliminating the powerplant in the fuselage nose, which is used for carrying baggage, mounting the new C-12 V-type engines, rated at 400 hp. on either side of the monocoque body. Other changes principally involved the fittings and refinements of the cabin. The Eagle, as it now stands, has an empty weight of 5310 lb., with a useful load of 3380 lb., distributed as follows: fuel 1600 lb., oil 180 lb., pilot and passengers 1600 lb. The original Eagle, which was described in AUTOMOTIVE INDUSTRIES of Jan. 22, 1920, had a total weight, including fuel and passengers, of 7450 lb., contrasting with 8890 lb. for the present model. The maximum speed likewise has been increased from 107 m.p.h. to a rated speed of 124.5 m.p.h.

The larger carrying capacity also has made necessary an enlargement of the machine itself, the present dimensions giving it a wing-spread of 64 ft. 4 in., a length of 56 ft. 7¼ in. and a height of 12 ft. 11 in. This machine, although surpassed in size by others, was fitted for larger passenger-carrying capacity than any of the others shown.

The remainder of the Curtiss machines were those described in the issue of Jan. 22, 1920. An additional exhibit was a model of the wind tunnel recently erected by the company for experimental purposes. Photographs of it were shown in the issue of Feb. 26, 1920.

Thomas-Morse Mail Plane

SEVERAL interesting features marked the mail plane shown by the Thomas-Morse Aircraft Corp. These were the double engine mounting, the seating arrangements for the pilots, the ratio of useful load to the weight of the plane itself and the construction of the frame work. Like the L-W-F freighter, the Thomas-Morse craft, which is a biplane, has a center nacelle and twin fuselages, but of different design; it mounts its two engines in the center nacelle, one in front and one in rear. The pilots, having dual control, sit in the two fuselages, the nacelle being given over to the engines, which are Wright-Hispano engines rated at 300 hp. each, and to freight compartments.

The ratio of loading is such that the weight of plane empty is 2890 lb., the useful load being 2610 lb., almost the weight of the machine itself. This high carrying capacity was made possible, it was claimed, by careful building up of the frame work with laminated wood. The framework throughout is laminated wood built up to a strength which gives a factor of safety of six. A cross-section of the wing is more nearly like the cross section of the wing of a bird than that of any other craft. It is thick at the front like the wing bone and tapers toward the rear. The foundation of the trailing edge is a wire stretched across the spar tips. The wing fabric is over the wire.

Every part of the plane is streamlined. The only exposed wires are those used for bracing between the planes. The control wires except those to the ailerons are inside the fuselages. There are two complete control systems—one in each fuselage.

In flight tests, the plane has demonstrated that it will stay in the air without losing altitude with only one engine running. The wing spread is 45 ft. 6 in., the wing depth 8 ft. 10 in. and the length overall 25 ft. 10 in. The maximum speed is 130 m.p.h.

Four of these machines are being assembled for the aerial mail service.

The Ordnance Four-Seater

A FOUR-PASSENGER biplane, fitting an Hispano-Suiza American-built engine rated at 150 hp., was shown by the Ordnance Engineering Co., designed, of course, for commercial work. The seating arrangement, which, perhaps, was one of its chief features, placed two passengers in the forward cockpit, protected by an automobile-type windshield, with the pilot and a companion in the rear cockpit, the controls there being dual. This fitting of dual controls was shown by many of the makers and seems to be a fixture on the larger type planes.

The wing span of the plane is 38 ft. and the length 24 ft. 10 in., the wing area being 355 sq. ft. The loaded weight was placed at 2300 lb., the allowance for passengers, baggage and a full load of 250 lb. of fuel being 955 lb. With this loading, the plane has a cruising radius of 290 miles at a speed of 90 m.p.h. The machine leaves the ground after a run of 350 ft. and lands after a run of 300 ft., a minimum speed of 45 m.p.h. was given it. The climbing speed is 5000 ft. in 10 min.

This plane was among the few to be equipped with an electric starter, the generator being placed on the landing gear and operated, of course, by a wind-driven propeller.

L-W-F Machines

POPULAR interest centered largely about the exhibit of the L-W-F Engineering Co. as it showed both the smallest and the largest planes in the hall. The former was a single-passenger monoplane, called the Model L Butterfly sport plane, with a wing span of 29 ft. 6 in., height of 5 ft. 10 in., length of 19 ft. and an empty weight of 595 lb., the loaded weight being placed at 918 lb. The machine was equipped with a 72 hp. Cato engine, having two horizontally opposed cylinders, air-cooled and with valves in the head. It was the only engine of its kind shown, both as to the method of cooling, the number of cylinders and their placing. The makers claim for the machine, as a result of recent tests, that it has a maximum horizontal flight speed of 72 m.p.h., with the ability of climbing 4800 ft. in 10 min. Flying under full throttle, it was rated as having a cruising radius of approximately 6 hr.

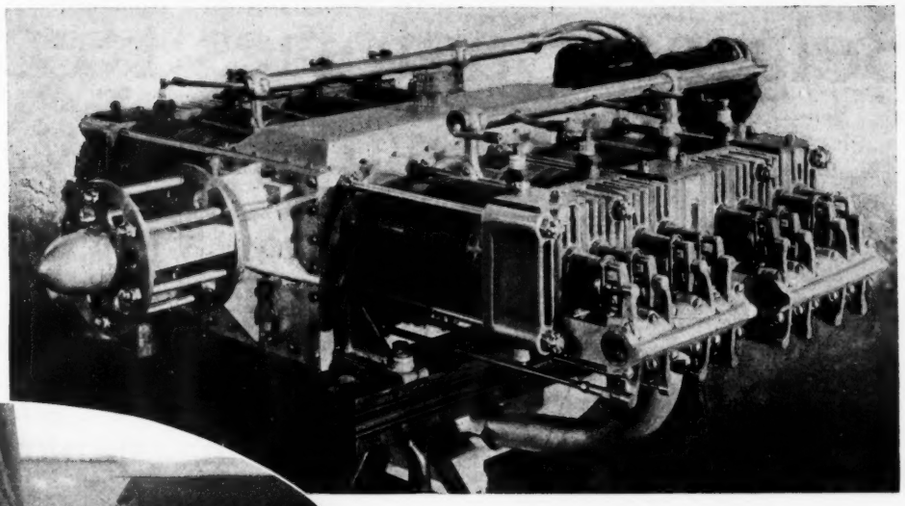
The second machine was announced as being the largest freighter in America and one of the largest yet built. It was designed primarily for the aerial mail service and was rushed to the show without having had a trial flight. It has a wing spread of 105 ft., being of biplane construction, and an overall length of nearly 54 ft. The design is of the twin fuselage and center nacelle type, with three 400 hp. Liberty engines, one being mounted in each of the noses of the fuselages and nacelles. The machine loaded was designed to weigh 20,000 lb. and has a mail carrying capacity of 3000 lb. on long distance flights or double that amount on smaller trips.

The crew and controls are located in the nacelle while the two fuselages, constructed of laminated wood, carry part of the fuel supply and the freight load. Four persons are designated as the crew, these being two pilots, a radio operator and a mechanic. At the maximum speed of 110 m.p.h., it is rated to remain in the air for 10 hr. or 16 at low speed. Climbing ability with full load is claimed if only two of its engines are working and it is designed to land at a speed of 56 m.p.h.

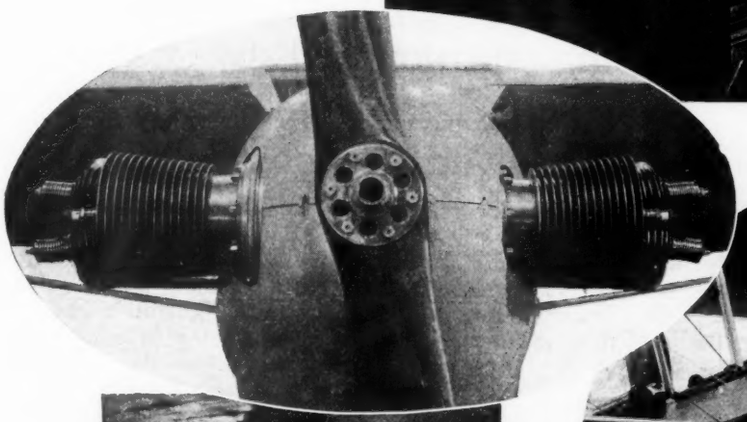
Among the features that identify the machine are the monocoque fuselage and nacelle, the intercommunicating

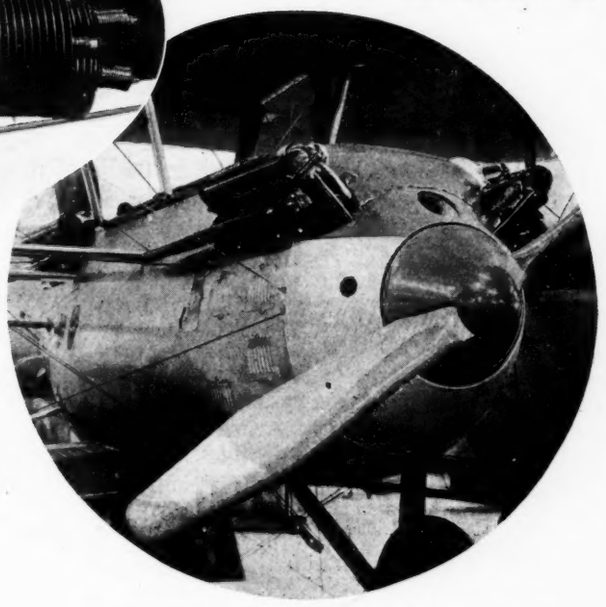
(*Continued on page* 653)

Mechanical Details from the Aircraft Show

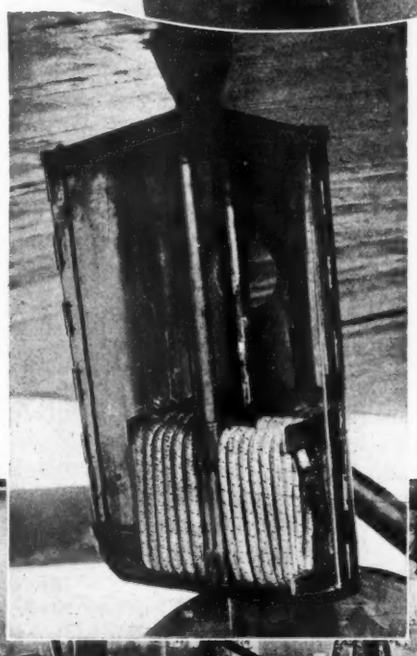


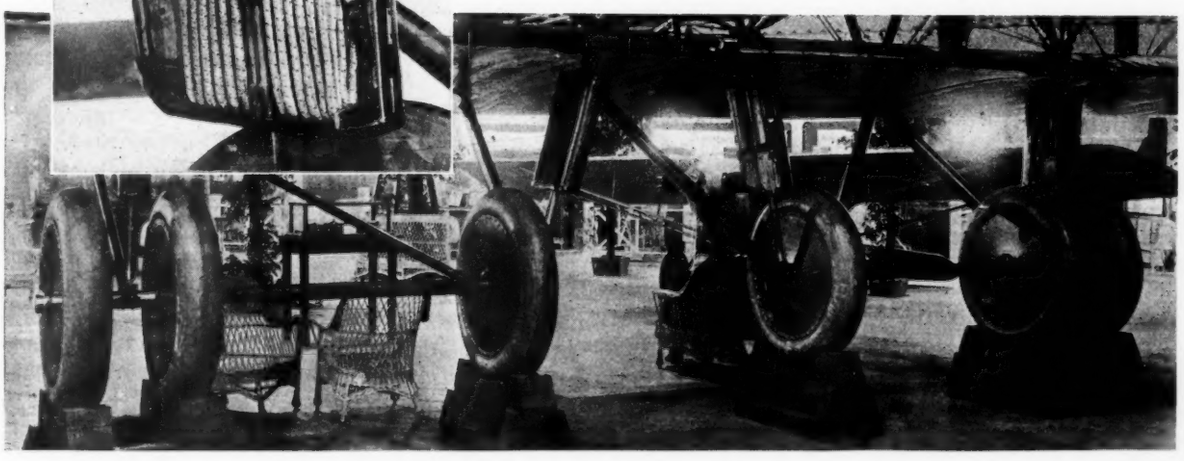
Above—The Beecher engine, with the Cato engine to the left





Mounting of one of the two engines on the Thomas-Morse mail plane





Landing gear of the L-W-F freighter, showing above a detail of the shock absorber

Belgian Factories Recover from the German Invasion

Mr. Bradley, returning from a lengthy trip through the automotive plants of that country, depicts vividly how they have overcome the effects of the war and returned industriously to work. He shows the various difficulties being surmounted by the little country and predicts the Belgians will be the first people of Europe to get over the hostilities.

By W. F. Brad'ey*

Brussels, Feb. 20, 1920.

WITHIN three months of the present date most of the leading Belgian automobile manufacturers will be in production on a basis equal to that of 1914. Some, however, will not be so fortunate, but this is a wonderful result entirely to the credit of Belgian manufacturers, who appear likely to be the first among the Europeans to recover from the war.

When the Germans went out of Belgium in November, 1918, they had stripped every factory of machinery and tools but, except in a few cases, the buildings were intact. The task of getting back into production was exceedingly difficult, for not only had raw material to be secured but machinery also had to be purchased. The difficulties have increased and not decreased since the Armistice. Progress is not general all along the line. While some factories are fully tooled up and are beginning to produce, others are in practically no better condition than when the Germans left them, and a few probably will drop out of the automobile industry altogether.

As a general rule, when manufacturers took the initiative and began reconstruction without waiting for the assistance of the Government, they have made wonderful progress. Where official help has been relied on, the factories are in a backward state. Indemnities for losses incurred during the war, either by German or Belgian military action, have not been paid uniformly. Some of the smaller firms, most in need of this assistance, state that they have not received a cent. Some of the bigger firms have been given an indemnity or are on the point of receiving it.

The first action of the Belgian Government on securing possession of their country was to distribute to the automobile factories Belgian and German army automobiles and trucks for repair. This was intended as a temporary measure in order to keep men employed while plants were being gotten together for production. Such leading factories as Minerva, F. N., Metallurgique and Excelsior have abandoned repair work and are into car construction. Many of the smaller firms, however, are still doing repair work. This is a bad sign. It means that the factories have not been able to get together plant and workers necessary for a resumption of their normal activities. The bigger factories having abandoned the repair of army vehicles, dealers are taking up this work. Having nothing to sell, for the home factories have produced nothing and importation has been difficult, this was an excellent opportunity for them.

The first action of enterprising Belgian manufacturers, after the signing of the Armistice, was to proceed to Germany in order to get possession of the machinery and plant that had been seized by the German military authorities. Generally the caretakers who had been left in charge of the Belgian factories discovered, by contact with German soldiers, to which factory each piece of machinery was being sent. This facilitated search, for it enabled the heads of departments to go direct to the German factories and identify their own machines. Frequently the Germans denied having possession of the machines claimed but, when a search was insisted on, they had to admit possession. When the Allied Commission got into Germany, they found that the research work had been done for them, in many cases, and only a signature was required to have the stolen machinery shipped back to Belgium. This machinery was not in good condition. Much of it had been modified for shell turning and in every case it had been roughly handled. Some of it cannot be employed again until extensive repairs have been carried out.

Four months after the Armistice an agreement was arrived at between the Belgian and the American

Mr. Bradley is the European correspondent of AUTOMOTIVE INDUSTRIES.

Governments, whereby the latter undertook to supply surplus machinery on advantageous terms. This machinery is now coming through regularly and is being delivered to the automobile factories and to the general engineering establishments. Shipments are made to Antwerp and from there it is distributed by rail to different parts of Belgium.

Some of this machinery is new but none of it has had more than slight service. It is all surplus American war stock and is sold at 50 per cent increase on 1914 list prices, plus 5 per cent for shipping and insurance. Credit of five years' duration is given, but this may be renewed for other periods of five years, relieving the Belgian manufacturer of immediate anxiety regarding the high rate of exchange. The detailed distribution of this machinery is in the hands of a private co-operative society, known as La Construction Métallique. In addition to acting as distributing agent, this body serves as intermediary between buyers and sellers and between manufacturers and clients by distributing information regarding markets and material.

This arrangement has been of immense value to Belgian manufacturers in enabling them to resume production. Most of them are well satisfied with the scheme. There are a few complaints that the used machinery has not always been in skilled hands and that it needs repairs before it can be put on accurate work. Not all the makers have taken advantage of this organization. Some few had been in a position to place orders direct during the war. A certain number of timid individuals kept out of the plan and are regretting it.

The coal supply of Belgium is good, this industry now being 94 per cent efficient. The steel mills suffered more and are as yet unable to meet home requirements. Practically all the special alloy steels required for the automobile industry have to be brought from abroad. Some of the forge plants are in operation but, until the Belgian steel plants are in production, they will remain dependent on foreign supplies.

Very Little Labor Trouble

The railroads of Belgium are working perfectly and are a striking contrast to those of France, where inefficiency and disorganization exist. Belgium has had comparatively little labor trouble.

Among automobile manufacturers, the opinions vary from slight nervousness to complete satisfaction. Among the Flemish element a certain dissatisfaction is being manifested and at times it is rather hard to maintain cordial relations between employers and workers. Among the Walloons, on the other hand, the labor situation appears to be more stable. Works managers were met who declared they had never known their men to work so willingly or to produce so much. For the first month after the armistice there was a spirit of laziness, but since then enthusiasm to produce has been the prevailing instinct. The workers of Belgium who remained during the occupation were not spoiled by their German masters; those who went to England and worked there felt that they had been driven out by a usurper and were enthusiastic to return to their own homes. The demoralization which was feared as the result of four years' idleness, has not made itself felt. The cost of living, too, so far as the working classes are concerned, has not increased to the same extent in Belgium as in other Allied countries.

In the engineering trade, it was feared that numbers of Belgians would be tempted to remain in France in order to get advantage of the higher wages prevailing there. This has not been noticeable to any considerable extent. If wages are higher in France, the cost of living is also more expensive and in all the manufacturing centers the housing problem is so acute that the Belgian family hesitates to emigrate. Although well received in England, the language and the totally different customs cause that country to be looked upon as foreign and emigration to it is not very common.

Since the Armistice, there has been a break between Belgian automobile manufacturers and dealers. For more than fifteen years the two have been united in one organization. But, since the home manufacturers have been unable to produce, interests have been divided and after a strained period the two groups have formed separate organizations. Belgium is the only country in Europe which has maintained her pre-war import duties on automobiles. These are based on weight, but are practically equivalent to an increase of 6 to 7 per cent on the value of the goods.

There being a great shortage of automobiles, which the home manufacturers could not meet, dealers naturally took up foreign representation. At least a score of American makers are now represented on the Belgian market and American cars are to be found everywhere.

Importation of American Cars

The importation of American cars had only just begun on an important scale when the exchange began to rise. With the dollar standing between 14 and 15 francs, or nearly three times its normal value, it is difficult indeed to do business with the United States. As an example of the disturbing influence, a Ford costs about 14,000 francs. American cars are still being sold but their cost is so high that, whenever possible, clients are holding back until Belgian cars get on the market. England has provided nothing, for not only was her exchange adverse but she was unable to deliver. France has done a little business, but the great difficulty here has been deliveries. A year ago Citroen took orders by the thousands. But, because of strikes and other reasons, he was unable to make deliveries and some unpleasant scenes were witnessed between clients and the Belgian dealers for this firm. Notwithstanding, Citroen is the foreign car seen in the greatest number in Belgium.

An attempt is being made to get German cars into Belgium. The low value of the mark and the moderate import duty makes this attractive but the number of such imports is limited by reason of the difficulties German firms appear to be having in making deliveries.

Belgian manufacturers are paying no attention to the agricultural tractor. As a consequence, this field is being left entirely to foreign makers. It is claimed that the demand is too small to justify the construction of such machines in Belgium. Farms are of small area and a tractor can only be used economically on a co-operative basis. Despite this, an agricultural tractor demonstration was held during the past year and two are promised for the present year, one being for machines consuming palm oil and evidently intended for the Belgian Congo.

The Belgian automobile firm which is most advanced is Minerva at Antwerp. This company had certain advantages over the others by reason of the fact that the directors left Belgium when Antwerp fell and were able to place orders in America and in England while the war was in progress. Machinery was thus ready to be shipped into Belgium as soon as that country was freed from German domination. Minerva is now working with a staff of 2000 and has begun deliveries on a four-cylinder Knight-engined car designed during the war. A six-cylinder model, also with the Knight engine, is being prepared and will be in production next May.

Although the Minerva company is the most advanced of all the Belgian factories, they have met with tremen-

dous difficulties during the past few months. In order to get into rapid production, arrangements had to be made for many supplies to come from outside. Belgium had only one important frame-producing plant and this was entirely destroyed when the Germans sacked Louvain. In consequence, Minerva placed orders in America for frames. Other orders were placed for ball bearings, forgings, gears, etc. The complaint is made by the director of this company that American firms accepted orders and made delivery dates which they have not at all lived up to. In an interview, the names of many leading American manufacturers of components were quoted, the dates being given for deliveries, many of which were six months behind time. This has created a bad impression. It is admitted that America may have her own difficulties, but it is claimed that orders should not have been accepted if there was no possibility of delivery. As the result of these delays, Minerva is more backward than would have been the case if supplies had been received in time. Practically similar treatment was received in England, where orders were accepted and delivery dates not lived up to as promised. It was impossible to get anything at all from France.

The Unfavorable Exchange Rate

In addition to these difficulties, Belgium had to fight the last few months against adverse exchange rates. With the dollar at 15 francs, it is practically impossible to purchase from America. Minerva gives a typical instance of the effect of the increase in exchange rates and rising prices in America. During the war, special bevel gears were ordered at $13 and at that time the dollar could be purchased at 5.70 frs. A few weeks ago the same spiral bevel sets cost $53, and the dollar was worth 15 frs. This is an increase of 1202 per cent!

Although in regard to labor Belgium is much better off than neighboring countries, Minerva was not altogether satisfied. It was stated there that there was discontent among the workers and repeated threats of strikes. The Minerva company has had two or three disputes. These have not all turned out to the advantage of the strikers. On one occasion the workers went back to the old terms and paid 5 per cent of their earnings into a general fund as a guarantee against further disturbances. This is a remarkable result, in view of the general tendency of the European labor market.

The Metallurgique company has been able to produce 200 cars since the armistice and expects to run up to 800 during the present year, this being more than equal to the 1914 output. During the German occupation, this factory was used by the army for repair work. The stocks of spare parts, therefore, were left untouched except when required for vehicles in service in the German army. All the machinery was taken away and has had to be replaced since the armistice. It is because of the spare parts in stock that this firm was able to produce during 1919.

The F. N. company, which is Belgium's leading small-arms concern, has been slower in getting into production. This factory, which is one of the finest of its kind in Belgium, was stripped almost completely, the only machinery left behind being that required by the Germans for the repair of their trucks. This machinery was put into the automobile section of the factory in order to get that branch into production as quickly as possible. At present, arrangements have been completed for producing 15,000 motorcycles during 1920. Three types of touring cars will be built but probably it will be six months before production has risen to the pre-war scale.

Excelsior lost everything, but the engineers who remained in Belgium during the occupation devoted all their time in getting out new designs. They even built an experimental car during the German occupation, but, of course, could not put it on the road. Since the armistice, machinery has been secured and the new models have been put into production. As a beginning, a modified type of pre-war chassis is being produced, but gradually this will give way to an entirely new type. Excelsior has completed much interesting experimental work. The new model is a six-cylinder with valves in the head. The construction is original, for the cylinder-head and the entire water-jacket form an aluminum casting mounted on the cylinder barrels. That type of construction gives the advantage of the detachable cylinder head without any of its inconveniences, as there is no danger of gas or water leakage at the head. The cylinder barrels are separate and in case of a scored or ovalized cylinder any one can be changed at slight cost. All Excelsior cars are fitted with four wheel brakes, to the exclusion of the transmission brake. These are the Adex type, patented by the Excelsior company, and operate diagonally by the use of one pedal. The braking effort is always uniform between a front and a rear wheel on opposite sides.

Patents have been secured for a flexible coupling between the flywheel and the clutch. In this construction the cone clutch member is connected to the flywheel by means of six studs mounted in rubber sockets. This gives a cushioning effect between engine and transmission and prevents all chatter in the universal, or in the gears, even when throttled down and a cylinder is misfiring. The gearbox on the new cars is at the front end of the tube enclosing the propeller shaft and is attached to a heavy cross frame member by means of yokes with provision for taking up lateral play.

Rear cantilever suspension has been adopted, with the adjunction of the patented Adex stabilizer. This is a pivoted parallelogram, uniting the center of the axle housing to the frame members. By this device all the advantages of cantilever springs are obtained without any of their inconveniences. Tests on the road show that even when taking corners at very high speed there is no tendency for the rear end of the chassis to swing outward. The rear tracks with the front in a most remarkable manner, giving a sense of security when cornering at speed quite unusual with cantilever springs.

Lack Frame Members

The Pipe company at Brussels has not yet gotten into production on automobiles, but is continuing on army truck repairs. Owing to the difficulties met with, this firm has decided that its first activity will be the building of machine tools. When this business is established, automobile construction will be taken up.

Sava, at Antwerp, is in a backward condition. This firm was robbed of its machinery only a few days before the Armistice and has not gotten much of it back from Germany. Army trucks are being repaired, but construction of a sporting type chassis will begin shortly.

Belgian manufacturers have been much handicapped for lack of frame members. The only plant of any importance, that of the Dyle & Bacalan company, was wiped out of existence when Louvain was sacked. Attempts were made to get frames from America, with great disappointment on the matter of deliveries. To meet the most urgent requirements, frames have been made up by hand, irrespective of cost. Dyle & Bacalan have rebuilt and will be in production within two months.

The most important steel forming and stamping plant in Belgium is that of the Derihon Bros., near Liège. This was stripped absolutely bare, but, within two or three days after the signing of the Armistice, one of the Derihon brothers was in Germany searching for his ma-

chinery. Such vigorous action was taken that by June, 1919, the requisitioned machinery was back at the factory and by August the works were in production.

This firm is producing as much as before the war. All the old machines have been replaced, but new ones are on order, and as each one arrives it replaces an old one. Before the war the Derihon Bros. secured their steel from Germany. All connection with that country has been severed, the special alloy steels being obtained from Sheffield, England, and the ordinary steels from Belgian firms. Derihon has made a specialty of stampings and forgings for automobile construction, his BND steel having become world-famous. The firm is exporting and has supplied all the special forgings for the French cars now building for the Indianapolis race. The labor situation at this factory is declared to be excellent. The men are paid a fixed wage and a premium for excess production. They are said to be producing more than before the war. The French factory of Derihon is not yet in production.

Van den Plas, the most famous of Belgian body builders, is at work with a staff of 650 and is producing nine high-class bodies per week. Many of these are exported to France to be fitted to French chassis in that country.

The first Belgian automobile show will be incorporated with the Olympic games to be held at Antwerp in May and June. It is intended, however, to have a purely automobile show in December in the Palais du Cinquantenaire, Brussels, which has become free from military control. Probably the really new post-war types will be held back until that exhibition. Among the novelties promised are a 12-cylinder Excelsior and a rotary valve Metallurgique.

Belgian manufacturers are making no attempt to get into the cheap car class. Their intention is to keep in the high-grade class for both home and foreign business. Manufacturers generally are not disturbed by the invasion of American cars. They consider that the cheap American cars will only add new recruits to motordom, and they are convinced that they can build cheaper than the better class American makers. Although the high rate of exchange is hitting them hard in the purchase of machinery and supplies, it is a most effective protection against the invasion of their market by American automobile manufacturers. Belgium is importing heavily from America on all kinds of goods, the value of the imports for the first nine months of 1919 being $283,417,698, equivalent to $37 per head of population. With the vigorous revival of Belgian industries, this amount should decrease very shortly.

Aircraft Makers Exhibit the 1920 Commercial Model

(*Continued from page* 648)

gasoline and the fire extinguisher systems. The wing construction is of the Pratt truss type and consists of three upper and three lower panels of 11 ft. chord and equal spans with a gap of 11 ft. Each wing is equipped with balanced interchangeable ailerons. Ribs are built up first and then slipped over the beams, which are built up of four pieces, thus forming a hollow box section; the top and bottom are of spruce and the sides of birch. The internal wire bracing is double, of No. 8 solid piano wire and 3/16-in. hard cable. All external wire fittings are applied directly to the beams and project through the covering.

The fuselages and nacelle are supported between the upper and lower planes on tubular struts thoroughly streamlined. A 12-cylinder high-compression Liberty enthree upper and three lower panels of 11 ft, chord and the nacelle, each engine driving a tractor propeller. The main load and crew are carried in the nacelle while each fuselage carries its complete power plant and has a small auxiliary compartment for excess mail or cargo.

Each power plant is complete within its respective fuselage or nacelle and consists of a 12-cylinder Liberty engine equipped with Splitdorf ignition, electric starters and compression release. The radiators are above the motors, directly in the blast of the propeller and equipped with individual shutter controls.

The tail is of the biplane type, attached to the rear end of the two fuselages. It consists of two double cambered horizontal stabilizer planes superimposed, with elevators attached and a fin on the top of each fuselage followed by a balanced rudder. A third balanced rudder is installed midway between the two.

The landing gear is of the six-wheel, two-axle type, with the outer two wheels side by side directly under the center of each fuselage and the other two wheels spaced equally between. The landing gear is so placed that when landing the center of gravity falls sufficiently far back of the wheels to prevent any tendency to nose over.

The Goodyear Blimp

THE Goodyear company exhibited the pony blimp shown at Chicago and previously described in this publication. Interest in it, from the development standpoint, centered around the recent announcement that the craft had been sold to a transportation company at Kansas City, Mo., where it would be used for various kinds of work. Goodyear, it was said, was working upon new machines and a model was promised within a few weeks.

The Dayton-Wright Models

NO changes have been made in the cabin cruiser and coupé models of the Dayton-Wright Division of the General Motors Corp. The two machines—the KT and the OW—were shown at Chicago and were described in AUTOMOTIVE INDUSTRIES of Jan. 22, 1920.

The West Virginia

THE West Virginia Aircraft Co. exhibited a three-esater tractor plane, with an upper wing span of 44 ft. 5⅜ in. and a lower wing span of 34 ft. 9¾ in. The gap between the wings is 61¼ in. It is 27 ft. ⅛ in. long and 9 ft. 9 in. high. Empty, the plane weighs 1700 lb. The gross weight of machine and load is 2400 lb., the useful load being 700 lb., distributed as follows: Fuel 133 lb., oil 40 lb., pilot 165 lb., passengers 362 lb.

The motor is an American-built Hispano-Suiza 8-cylinder water-cooled type. Its rated horsepower at 1400 r.p.m. is 150. The weight per horsepower is 2.88 lb.

The machine has a speed of 77 m.p.h. and in minimum horizontal flight 40 m.p.h. It can climb to a height of 4000 ft. in 10 min. The maximum range at economic speed is about 150 miles. The standard equipment consists of a tachometer, oil gauge, gasoline gauge, clock and altimeter.

Exhibit of Tractor Equipment Shows Improvement and Advance of Industry

Much of the space at Kansas City was given over to the display of new parts and accessories which Mr. Heldt describes herewith. Engines, transmissions, steering gears, radiators, spark plugs, steels and castings, seats, safety devices, pulleys and dynamometers are included.

By P. M. Heldt

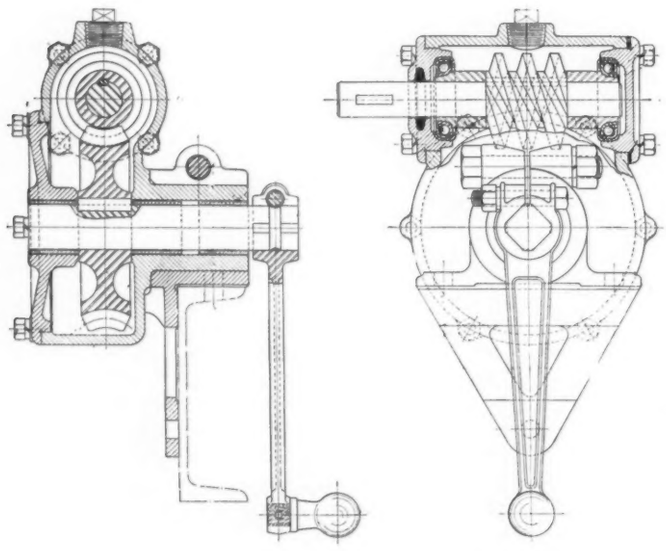
A CONSIDERABLE portion of the space at the Kansas City Tractor Show was given over to exhibits of tractor components, accessories and supplies. Altogether there were about one hundred exhibitors in this class. The principal ones showed engines, clutches, transmissions, steering gears, wheels, ball and roller bearings, carbureters, magnetos, spark plugs, radiators, fans, oilers, air-washers, piston rings, mufflers, castings, forgings and bearing materials.

Most comprehensive was the exhibit of tractor engines, of which no less than fourteen makes were shown, not counting one that was not exhibited by its manufacturer and not with the object of closing sales contracts for engines. The newest design among these engines is the W-S-M, designed by Joseph Van Blerck, a well-known marine engine designer, to which a special article will be devoted. The Waukesha Motor Co., which has long been specializing on tractor engines, has brought out a complete new line in five sizes, which is based somewhat on the Class B engine of the Quartermaster Corps. The engines exhibited by the different firms cover a range of sizes suitable for 2- to 4-plow tractors, with the exception of the Le Roi, which is used largely on motor cultivators. This is a 4-cylinder engine, with 3⅛ x 4½-in. cylinders.

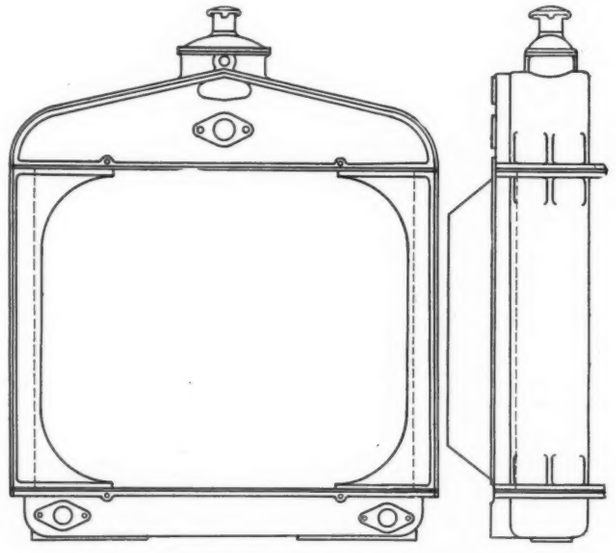
Of transmission exhibits, there were only two, the Nuttall and Foote, both showing models combining the change gear, final drive and rear axle in one unit. The Nuttall company had an electric furnace installed at the show and gave demonstrations of the effect of heat treatment of steel. Samples of heat-treated and untreated steel were broken and the effect of heat treatment was brought out in the difference of the grain. Sclerometer tests were also made.

This company also exhibited what is claimed to be the first steering gear specially designed for tractor work. It is of the worm and complete wheel type, and sections of the gear are shown herewith. The steering column can be placed at any angle with relation to the frame, so as to permit of the proper location of the steering wheel. The housing is cast with a bracket for fastening it to the frame. By reversing the worm shaft a left-hand unit can be made of the gear. The worm is cut from machine steel and the wheel of drop-forged steel, while the casing is of cast iron. The steering arm is a drop forging and is provided with a separate drop-forged, heat-treated ball end. The worm shaft is carried on combined radial and thrust ball bearings.

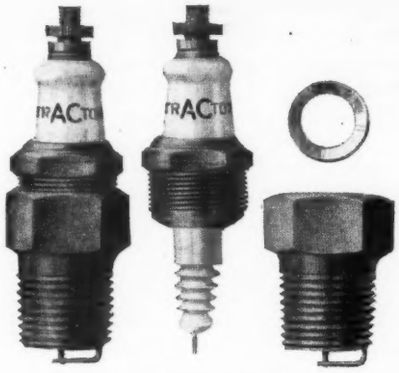
An endeavor to standardize tractor radiators is being made by the McCord Mfg. Co. The advantage accruing to the tractor manufacturer would be that he would save all tool and pattern charges. An outline drawing of the radiator is shown herewith. It is made in three sizes—small, medium and large—measuring 23, 28 and 33 in. in overall width, respectively. Further variation in capac-



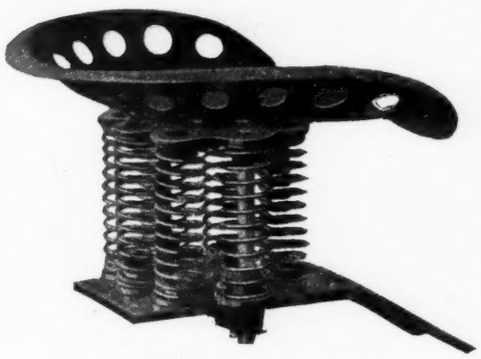
Sectional views of Nuttall tractor steering gear



Two views of the McCord tractor radiator



A. C. tractor spark plug



Adjustable spring seat

American wrought steel pulley

ity is secured by changing the depth of the core, as well as by varying the height of the side members, from 17¼ to 35½ in. The radiator is of the finned tubular type, made in five parts—top and bottom cast tanks, two cast side pieces, or spacers, and the core. Head sheets of No. 20 gage stock are provided on the core, which are bolted to the cast-iron frame.

Special Tractor Spark Plug

A special tractor spark plug has been brought out by the A. C. Spark Plug Co., of Flint, Mich. The regular A. C. plug is a one-piece, non-detachable plug, but it is figured that in kerosene-burning tractor engines it is necessary to have the insulator core removable for purposes of cleaning. There are many spark plugs on the market which can be taken apart for cleaning, the insulator being clamped between the shell and gland nut. Unfortunately the tractor operator, in taking the plug apart and putting it together again, is usually not very careful, and if he puts too much pressure on the porcelain he is apt to crack it. To obviate this difficulty in the A. C., the porcelain is spun into the gland nut and this assembly is screwed into the shell against a tapered seat on which there is a copper-asbestos gasket. It is obvious that the force with which the gland nut is screwed home does not affect the pressure on the porcelain.

There is also a special feature in the design of the porcelain. This is formed with a number of sharp edges, or circular ridges, near its inner end, and these edges are supposed to get so hot in operation as to burn off any carbon that happens to form on them, thus preventing the formation of a continuous leakage path.

Steel Castings

Manganese steel is a material of great resistance to abrasive wear, and as such has found application in farm tractors. During the war it was used for the chain tracks of artillery "tanks" and previously it was used for rails of street car lines where short curves have to be described and where the wear naturally is heavy. The Taylor-Wharton Iron & Steel Co. exhibited various sample castings of manganese steel for tractors, which are marketed under the trade name, "Tisco." For crawler-type tractors this steel is recommended for shoes, links, pins, lugs, grousers, spacing blocks, sprockets, chains, rollers and gears, and for wheel-type tractors for bull gears, pinions and sprockets.

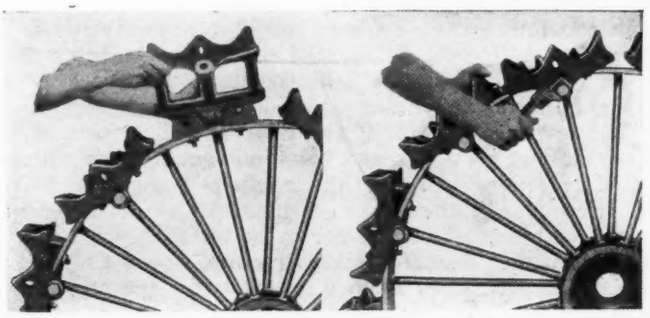
Steel castings for automotive parts were exhibited by the Hubbard Steel Foundry Co. In the past automotive engineers have been rather averse to the use of steel castings, especially for parts that require a large amount of machine work done upon them, as it will happen that when the machining is nearly done a blow-hole is struck, which makes it necessary to scrap the whole piece. The Hubbard company claims to have overcome this. Since the war this concern has been engaged in research work, which has enabled it to materially improve its product. To prevent the formation of blow-holes, use is made of ferroaluminum. This alloy is broken up and placed in the bottom of the ladle and, when the molten steel is then poured into the ladle, the ferroaluminum will melt and the aluminum will combine with the oxygen combined with the steel, thus preventing blow-holes. One of the important parts specialized by the Hubbard company is rear axle housings for trucks and tractors. In order to overcome the objection of waste due to blow-holes, the concern offers to make an adjustment on machining cost. From 2000 to 5000 tons of steel are poured each month.

Cushioned Seats

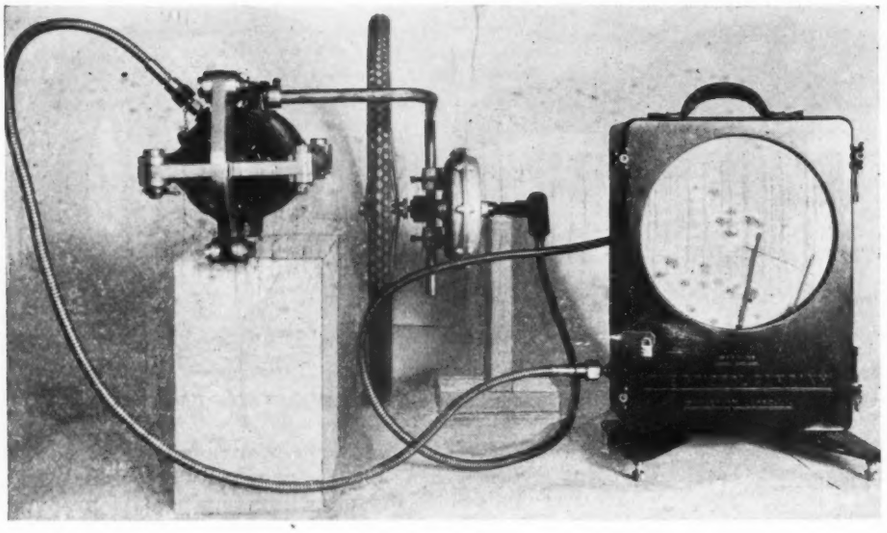
The need for more comfort for the operators seems to be generally recognized, and some of the newer tractors are fitted with upholstered seats and with seat backs. Then, a good many tractor seats are so arranged that the operator can swing them out of the way when he gets tired sitting on them and stand on the platform for a while. A new seat was exhibited by the Adjustable Spring Seat Co. It consists of a pressed steel, or agricultural type of seat, supported on eight coiled springs. Six of the eight springs can be removed easily and in this way the seat adjusted to the weight of the operator. The springs are said to work best when carrying a load of about 30 lb. each, so, for a driver weighing about 180 lb., six springs should be used and the other two removed.

A new form of tractor traction device was exhibited by the Grid-Iron Grip Co. About twelve of these grips are used per wheel. Each consists of a base bolted to the wheel rim and a swiveling rocking lug pivoted on the base. The grids are made of electric steel and are said to be very durable. They can be attached to any wheel. A saving in power is claimed because, with these swiveling grids the wheel does not roll up a ridge in front of it.

A safety device for tractors, intended to prevent injury to the engine when the oil supply in the crankcase



Method of attaching Grid-Iron grips



The Szekely dynamometer

runs low (in engines with splash lubrication) was exhibited by the Cleveland Automatic Cut-Off Co. It consists of a steel barrel, or reservoir, containing a cork float securely fastened to a steel rod. This rod extends through the top of the barrel and is fitted with a brass cap. The device is attached to the oiling system of the motor. As long as the oil is at the proper level in the crankcase and the oiling system is working properly, the float stays up, but the moment the oil gets too low in the crankcase for the oiling system to function properly, the float sinks, and as it is connected with the ground wire of the magneto, ignition is cut off and the engine stops.

The American Pulley Co. showed wrought steel belt pulleys suitable for tractor use. These have a triangular center secured to a cast-iron hub. The pulleys are made in sizes varying from 8 to 14 in. in diameter, 15/16 to 3½ in. in bore, and 2 to 8 in. in width of face. Probably the greatest advantage is the low weight.

New Traction Dynamometer

The O. E. Szekely Co. has developed a traction dynamometer, and will manufacture same for the market. The outfit comprises three elements—a hydrostatic ram, a speed reduction mechanism and a recording gage. By means of this instrument it is possible to measure the total distance traveled in a tractor test, the speed, or distance traveled per minute, the total drawbar pull in pounds, and the work done in foot-pounds per minute.

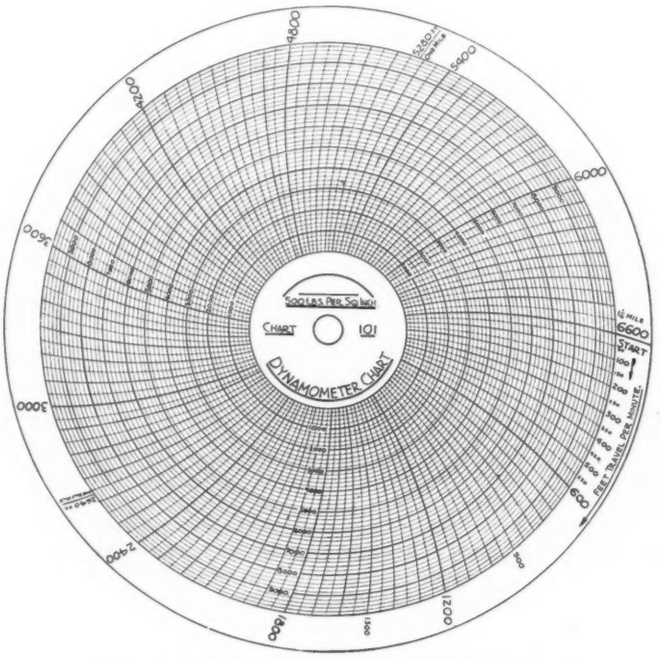
The hydrostatic unit consists of a cast-iron cylinder with piston, both parts being made of a fine grade of cast iron containing 20 per cent steel. Within the cylinder behind the piston or ram there are two overlapping leather cups containing the oil. These are of the dual seal type, with a spring wire pressing the inner cup against the outer, and thus preventing leakage. To prevent surging of the oil due to sudden changes in draft, a spring set-ball check is inserted in the line to the gage, provided with means of adjustment in the form of a plunger increasing or decreasing the spring pressure.

The pressure gage is of the Bourdon tube type and is direct-acting, all pivots and trunnions having been eliminated in order to prevent the readings being influenced by friction. As the range of pressures to be indicated varies with the size of tractor to be tested, several units will be made. One, for small tractors, has a chart for registering pressures from 0 to 1000 lb.; another, suitable for the general run of 2- and 3-plow tractors, registers from 0 to 3000 lb., and a third set is made with one unit for from 0 to 6000 lb. and another for from 0 to 10,000 lb. As already stated, the Bourdon tube directly operates the indicator hand scribing the pressure line or draft line upon the chart. The chart is rotated by means of a mechanical device connection to a bicycle type of wheel, which is trailed over the ground by means of an angle rod connection to the hydrostatic unit. In the instruments made so far, the gear reduction has been such that with a tractor speed of 2½ m.p.h. the chart would make one complete revolution in one-half hour, and therefore have traced upon it a line showing the variations of the draft over a distance of 1¼ miles. As tractors when used for different purposes vary considerably in speed, it is planned in the future to provide for three different gear reductions in the box, one giving a half-hour record on the chart with a tractor speed of 2 m.p.h., the second the same at 4 m.p.h., and the third the same at 6 m.p.h.

The Time Element

In addition to pressure and distance traveled, there must be recorded on the chart the elapsed time, and this is accomplished by a clock set in the recording gage housing at the bottom. This clock, by a ratchet wheel, actuates a second hand adapted to scribe a line on the chart just outside the scale circles. As the lever drops off the point of each ratchet tooth a sort of check mark is made on the chart, and the distance apart of adjacent check marks shows the distance traveled in one minute.

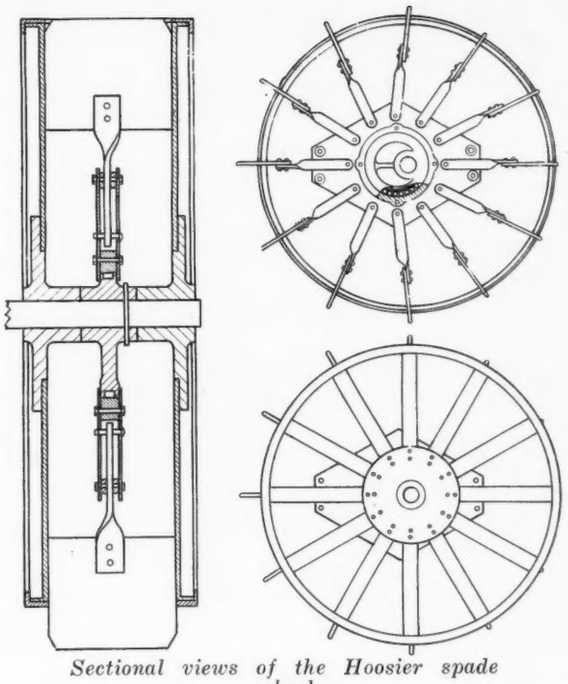
An interesting feature of construction is the tube connecting the hydrostatic unit with the gage. This is a copper tube of 1/16 in. outside diameter, which is formed into a closely wound coil and protected by a steel cable covering. Connections are made at both ends by substantial unions. The bore is only about 1/32 in.



Blank chart for Szekely's tractor dynamometer

Hoosier Spade Wheel

Reference was made in our report of the show, in the issue of Feb. 26, to the Hoosier wheel, but the remark there made that it was similar to the German artillery tractor wheel shown at Ottawa Beach last summer is not quite correct. The German wheel had a mechanism by which the spade lugs could be made to protrude more or less from the wheel rim in accordance with the requirements. In the Hoosier wheel, on the other hand, the spade lugs are combined in an assembly which turns around an axis eccentric to the wheel axis and the arrangement is such that on one side of the wheel the lugs are withdrawn while on the opposite side they protrude from the wheel rim. The eccentric can be swung around the wheel axis so that the lugs will be protruding from the wheel at the bottom and withdrawn at the top, or if no lugs are required, the eccentric may be set to cause the lugs to protrude on top and withdraw at the bottom. It will be understood, of course, that each lug moves in and out once each revolution of the wheel, and this action of the lugs tends to keep the wheel clean. The sectional view herewith shows the construction of the wheel. On the outside of the eccentric there are two sets of two pins and two opposite lugs are arranged with their spokes between one set of these pins, thus determining the position of the eccentric.



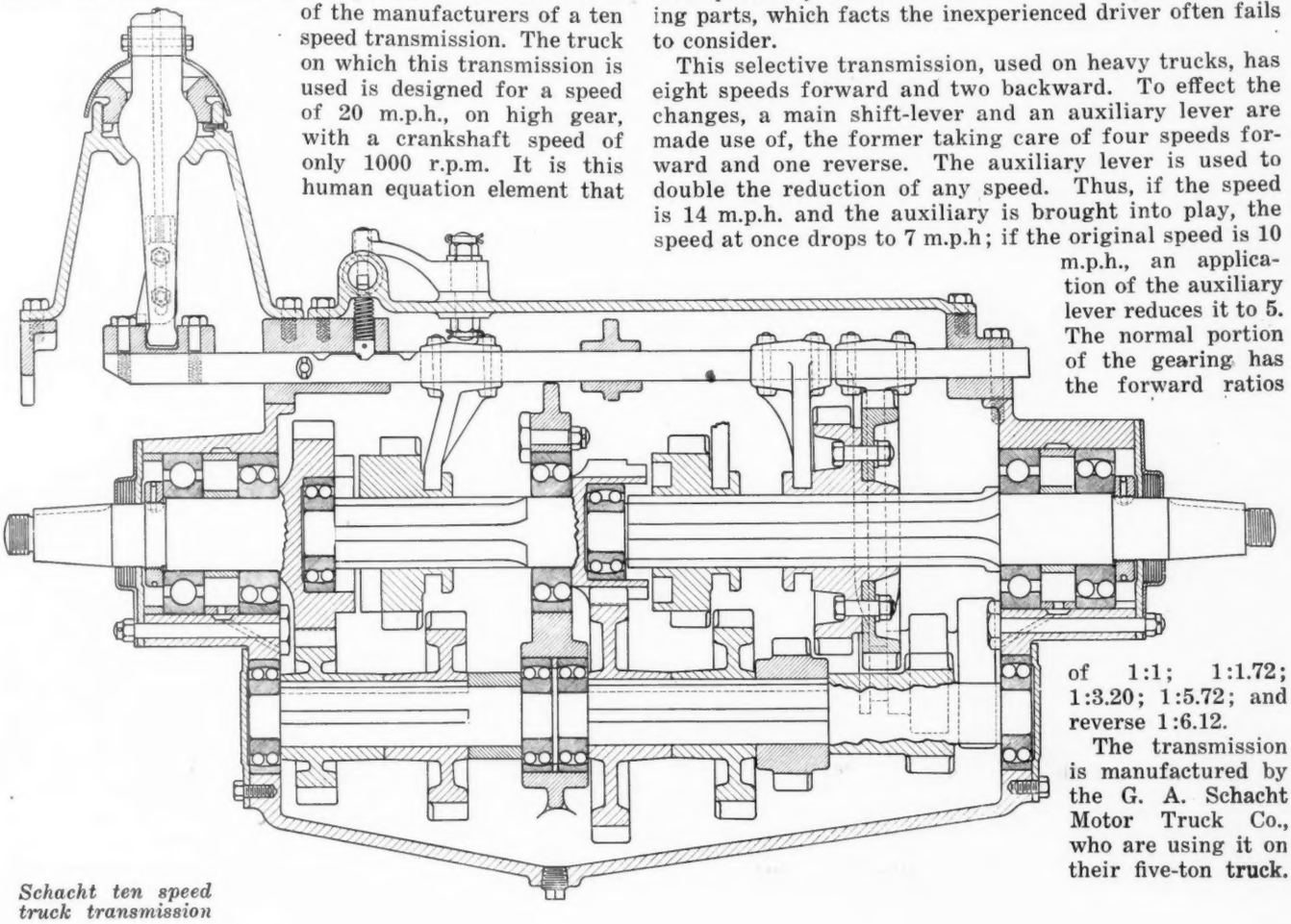
Sectional views of the Hoosier spade wheel

Ten Speed Transmission Truck

THAT there is a natural tendency for a driver to speed a truck, when empty or on good roads, whether or not such a truck is built for high speeds, is the contention of the manufacturers of a ten speed transmission. The truck on which this transmission is used is designed for a speed of 20 m.p.h., on high gear, with a crankshaft speed of only 1000 r.p.m. It is this human equation element that has induced the makers to provide additional gears, for if an engine is not intended for high speeds, an excessive speed may cause undue vibration or injure the moving parts, which facts the inexperienced driver often fails to consider.

This selective transmission, used on heavy trucks, has eight speeds forward and two backward. To effect the changes, a main shift-lever and an auxiliary lever are made use of, the former taking care of four speeds forward and one reverse. The auxiliary lever is used to double the reduction of any speed. Thus, if the speed is 14 m.p.h. and the auxiliary is brought into play, the speed at once drops to 7 m.p.h; if the original speed is 10 m.p.h., an application of the auxiliary lever reduces it to 5. The normal portion of the gearing has the forward ratios of 1:1; 1:1.72; 1:3.20; 1:5.72; and reverse 1:6.12.

The transmission is manufactured by the G. A. Schacht Motor Truck Co., who are using it on their five-ton truck.



Schacht ten speed truck transmission

Gear Production and the Method Involved in the Cutting

Accurately proportioned teeth, an economical rate of production and a uniformity of output are among the requirements facing the manufacturer. An explanation is given here of two classes of machines developed for such work, Mr. Trautschold going into detail in describing the process.

By Reginald Trautschold, M.E.

THE involute form, or type, of gear tooth—quite irrespective of its merits or shortcomings—is now the recognized standard for virtually all varieties of externally meshing gears, whether they be of the spur, spiral or worm type, and the problem confronting the manufacturer of cut gears is twofold. First, accurately proportioned gear teeth are essential to secure satisfactory operation of the gearing, and, second, the rate at which gears can be produced must be high in order to reduce the cost of manufacture.

To these two main requirements, however, should be added a third—uniformity of output—though this would appear to be assured if accuracy in reproduction of the involute tooth profile could be realized, for the involute curve is of mathematical exactitude and not susceptible to variation. Unfortunately, a pure involute set of gears cannot be made on the 14½-deg. system, or even on the 20 deg. system, on account of the unavoidable "involute interference," so the profile of the so-called "standard" form of involute tooth may depart from the involute curve for the greater part of its depth. Uniformity of output, therefore, would appear also to be an essential requirement, for the necessary modification to the involute curve must be standardized as well as the form of the tooth.

Limitations of Involute System

The limitations and inaccuracies of the involute system are due to the fact that in many ordinary gearing combinations the teeth of the respective gears, if of pure involute profile, would interfere, the gears would not mesh and run together on account of advancing teeth meeting obliquely, wedging, and tending to force the engaging teeth out of mesh. In the involute system, a normal from any point on the true involute profile of a tooth is tangent to the base circle of the gear and the path of point of tooth contact throughout the engagement, or line of pressure, is a straight line passing through the instant axis of engaging gears, inclined to the plane of common tangency at an angle customarily referred to as the pressure angle or angle of tooth obliquity. The greater this angle, the freer the combination is from involute interference; that is, by increasing the pressure angle, interference of teeth can be avoided

It is this peculiarity of the involute system that enables the center distance of engaging gears to be increased somewhat and still maintain proper tooth action, for increasing the center distance of engaging gears is equivalent to increasing their pitch diameters slightly but not the diameters of their respective base circles. The effect is simply to increase the pressure angle, for otherwise, the characteristics of the gear teeth are unaffected. This is the chief advantage of the involute system of externally meshing gears, for it permits a certain adjustment of center distances without destroying the smoothness of action.

Involute interference varies inversely with the obliquity of the teeth, it is evident, and this is one reason the 20 deg. system has supplanted the 14½ deg. system for certain lines of gearing, in spite of the decreased efficiency in transmission due to the greater axial thrust developed by the heavier pressure angle. This is not the only reason, or the most important, for the frequent adoption of the more oblique tooth, it is true, but it illustrates the logical method of avoiding interference.

Avoiding Interference

Obviously, the avoidance of involute interference by increasing the obliquity of the teeth on the pitch circle can only be carried to a certain degree and the only other way of overcoming the difficulty is to destroy the pure involute curve over such section of the tooth profile as develops interference and to remove the interfering portion of the teeth. Interference will occur whenever a gear combination is such that the point of tangency of the line pressure with the base circle of the pinion lies within the addendum circle of the engaging gear. When such point of tangency falls on or outside the addendum circle of the meshing gear, interference is avoided. It is thus apparent that three factors affect interference, the number of pinion teeth, the speed ratio of the combination and the pressure angle of the teeth. The limitation placed on the involute system of gearing by involute interference, therefore, is a serious one and must bear considerable weight on economical production.

The factors influencing interference have been thus enlarged upon before considering methods of commercial gear cutting in order that the advantages, shortcomings and reliability of various methods employed in the production of externally meshing cut gears may be more readily appreciated.

There are two methods by which surfaces may be reproduced, by the forming or the generating principle. The forming principle necessitates the use of a cutting tool with a cutting profile the conjugate of the surface to be reproduced and is simply and well illustrated in the operation of milling a cylinder with a concave cutter.

The forming principle, as it pertains to gear cutting consists of cutting the individual tooth spaces with a tool—usually a mill, to minimize the cutting time—conforming in cutting profile to the shape of the finished tooth space. The generating principle of gear cutting may be likened, so far as the result obtained is concerned,

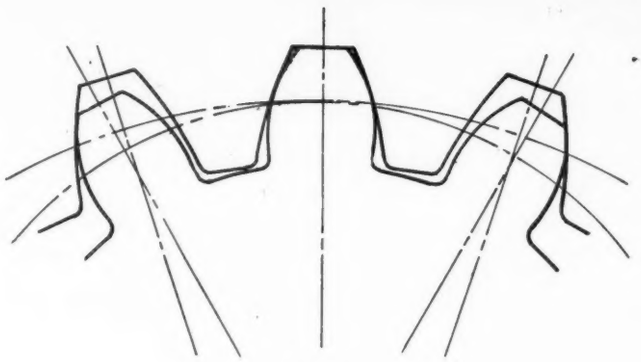


Fig. 1

to causing an accurately proportioned gear, or gear tooth, to roll in mesh with a plastic blank and so produce accurately proportioned teeth on the plastic blank which mesh with and engage precisely the teeth, or tooth, of the generating gear or tool. Applying the generating principle to cutting metal gear blanks necessitates the use of a tool, provided with hardened cutting edges, advancing in a line paralleling the tooth space axis and rapidly removing the metal as the gear blank is revolved upon its axis.

Forming Gear Teeth

In order to produce accurately proportioned gears by the forming method, a particular cutter would be required for each gear with a certain number of teeth, of a certain pitch and of a certain angularity of teeth. This would entail an unwieldy number of involute cutters for a manufacturer producing more than one of two individual sizes of gears, for which reason, in commercial gear production, sets of involute cutters have become accepted standards, each cutter supposedly being suitable for cutting gears with teeth of a certain pitch and angularity and in number covering a certain specified range. Until comparatively recently, a set of involute cutters for forming gears with teeth of given pitch and angularity, from 12 in number to a rack, consisted of eight cutters. More recently, the standard set has been increased to fifteen in number, by adding intermediate cutters. In the eight cutter set, for illustration, a No. 4 cutter was supposed to be suitable for machining gears of from 26 to 34 teeth. The introduction of the intermediate numbers refined the set by limiting the No. 4 cutter to use in machining gears with from 26 to 29 teeth and adding the No. 3½ cutter for gears with from 30 to 34 teeth.

The fifteen cutter set is a great improvement over the original standard, it is true, but it is also evident that, if the No. 4 cutter is correct for 26 teeth it cannot also be correct for 29 teeth, or if the No. 3½ cutter forms accurate teeth for a gear with 30 teeth, it fails to be correct for machining gears with 31, 32, 33 or 34 teeth, for the curvature of the involute profile changes with the number of teeth—see diagram, Fig. 1. Furthermore, the involute cutter is fitted to a template which is customarily filed out to approximate involute curves drawn on sheet metal, or in advanced practice, fitted to a template which is generated. In either case, no assurance is provided that the gears produced by the involute cutters will operate without interference, even if the cutting tool should exactly fit the template. It is just as impossible to produce sets of involute cutters of "standard" involute profile for gears with a difference in the number of teeth as it to produce sets of a limited number of cutters suitable for a complete set of gears. Production by the forming method necessitates that the ends of the gear teeth—at least in gears with certain numbers of teeth—be rounded off to enable them to mesh. Though the involute profile toward the top of the teeth has to be modified in any event to enable certain standard involute gears to operate without interference, the modification necessary is not that of rounding off the tops of the teeth or arbitrarily destroying the involute curve in the vicinity of the addendum circle, as has to be done in gears machined with formed cutters.

The forming method in machining gear teeth fails in at least one of the main requirements—accuracy of tooth proportions—for productive gear cutting.

The section of a gear with an infinite number of teeth is a rack and in the involute system the profile of the rack tooth is a straight line inclined to the axis plane of the tooth and at right angles to the line of pressure or action. The curvature of the tooth profile disappears and the straight side of the tooth is of the type of surface most readily, cheaply and accurately reproduced by mechanical means, a simple, straight sided, "V" shaped cutting tool of truncated form, accurately conforming in section to the shape of the involute rack tooth space, being employed. Such a cutter, representing as it does a "master form," is the basic implement used in all systems of gear tooth generation.

The Principle of the Bilgram Machine

The principle upon which the Bilgram generating machine operates—depicted in the diagrams shown in Fig. 2—illustrates the simplest and most readily understood method of generating gear teeth. A simple straight-sided, truncated, cutting tool, conforming in cutting outline to the exact shape of the tooth space of an involute rack of the pitch and angularity of the teeth to be generated, reciprocates rapidly and at the same time travels in one plane from one side of the gear blank to the other, the gear blank meanwhile turning upon its axis at a peripheral speed for its pitch circle equaling the speed of traverse travel for the reciprocating cutting tool, just as a gear would revolve if actuated by an advancing rack. Ob-

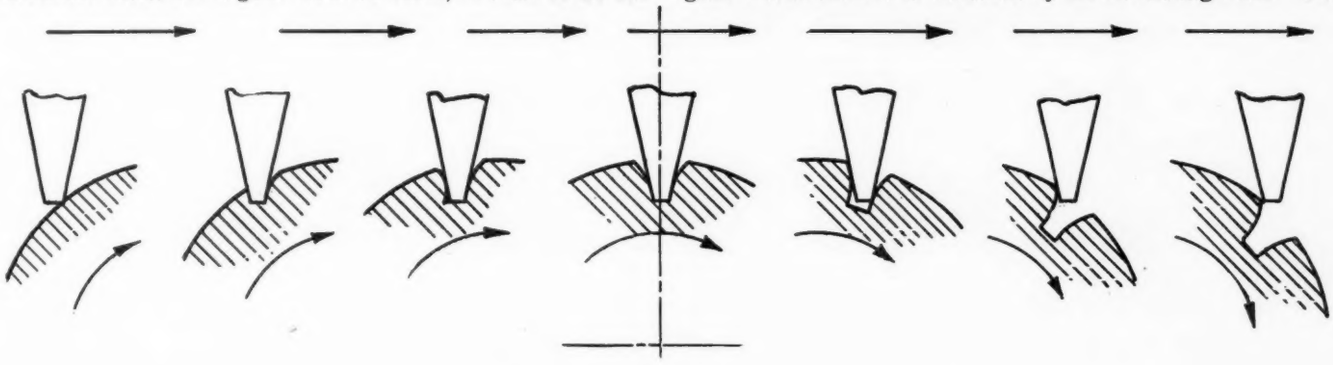


Fig. 2

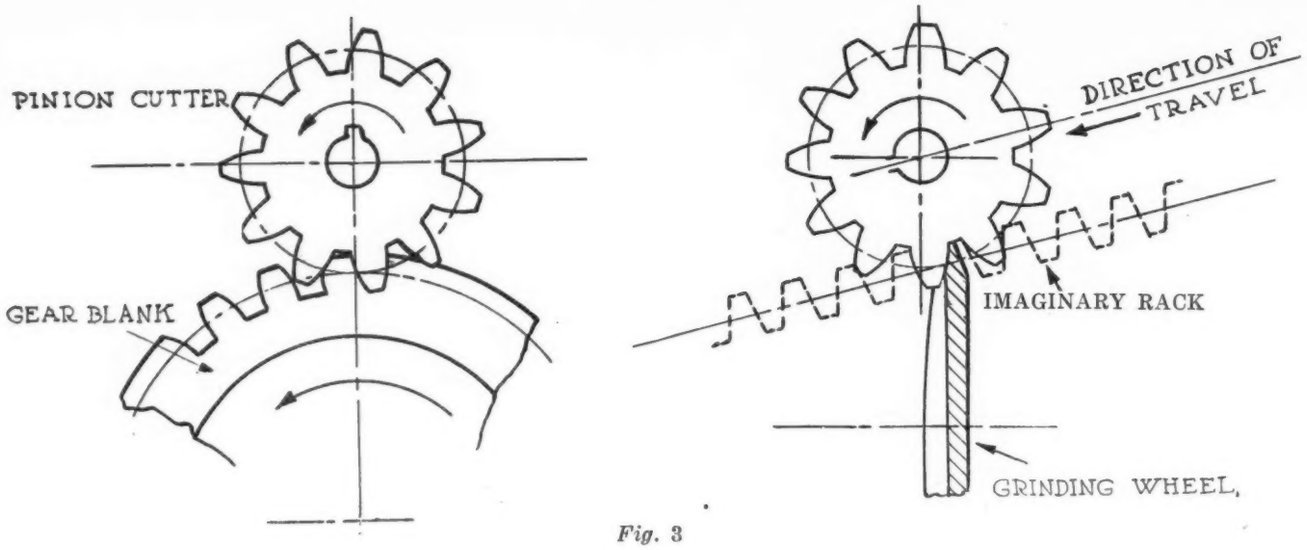


Fig. 3

viously, the simple reciprocating tool machines a tooth space bounded by profiles of pure involute curvature, completing the operation during the side travel of the cutter—see diagrammatic depiction. The same cycle of operations has to be repeated for each tooth space machined and, with only one cutting tool, the gear blank has to be indexed over the requisite distance between productive operations. In this manner, the action of a gear meshing and operating with a true involute rack is duplicated but, as the rack has but one operating tooth and there are no adjacent teeth to obstruct the advancement of the gear, the limitations placed on the involute system by tooth interference are disregarded. Thus gears generated by this basic method with teeth of pure involute profile may be quite incapable of being run together, on account of the involute interference which may be developed. Modification of the pure involute curve is necessary for gears with more than a certain number of teeth.

Factors Determining Interference

Involute interference can only be avoided, as has been demonstrated, by proportioning a gear combination so that the point of tangency of the line of pressure with the base circle of the pinion lies on or without the addendum circle of the meshing gear. This is fundamental. As a rack may be considered a gear with an infinite number of teeth, it is obvious that there will be no interference between the gear teeth of pure involute profile and a standard involute rack until the number of teeth to the gear, acting as the pinion meshing with the rack, exceeds some definite maximum number. In the 14½ deg. system, interference between the teeth of a rack and pinion begins when the pinion has 31 teeth and, of course, the amount of interference increases as the teeth of the pinion are more numerous. In the 20 deg. system, interference commences in rack combination when the pinion has 17 teeth.

A gear with a small number of teeth—customarily 12 in number, for the teeth of a gear with fewer teeth would be seriously weakened by undercutting—may then be generated with a single rack tooth and its teeth of pure involute profile not interfere with the teeth of a standard rack or the teeth of any other gear of equal pitch and obliquity which will likewise operate with a standard involute rack without interference. Furthermore, the gears which will operate with the standard rack without interference, will also operate together. It is this fact which is the basis of the principle upon which the Fellows gear shaper operates. The reciprocating cutter of this type of gear generating machine is a tool of gear form, with accurately proportioned teeth of involute profile, hardened, relieved and provided with keen cutting, or shaping, edges. In operation, the pinion-cutter reciprocates axially across the face of the gear blank being generated, revolving upon its axis as would a pinion actuating a meshing gear, while the gear blank also revolves upon its axis at a proportional speed, thus duplicating the operating action of a pinion and gear of similar speed ratio. Suitable indexing mechanisms control the movement of the cutter and of the gear blank and the result secured is identical to that which would come about were a pinion of some hard material and of accurate tooth proportions made to roll in mesh with a plastic gear blank—teeth of accurate form to mesh precisely and without interference are generated on the gear blank.

The curvatures of the generated teeth are of pure involute profile up to the interference circle, should one exist, and correctly modified between the interference and addendum circles to avoid interference of teeth, for, since the teeth are generated by cutters of pure involute curvature, the modification cannot be other than accurate and precise. The modification in profile curvature over the section developing involute interference consists in a progressive increase in the obliquity of the involute curve, for each individual point on the modified profile is also a point on an involute of a specific curvature, as it is a point of normal contact with a straight line tangent to a circle concentric with the base circle of the gear. In other words, the modification consists of a gradual increase in the angularity of the line of pressure, or pressure angle, and this, quite obviously, is very different from an arbitrary modification of the profile by rounding off the ends of the teeth. The Fellows system generates accurately proportioned gear teeth of "standard" involute profile. Uniformity of output is also assured by the ingenious and correct method of tooth generation.

Generating the Pinion-Cutter

The teeth of the pinion-cutter are themselves generated, but the operation is complicated by the fact that the cutting teeth have to be hardened and then precisely finished to make them efficient and effective tools. This necessitates that the cutter teeth be first roughed out, leaving a certain excess of metal to be removed subsequently. The cutter is then hardened and finally the profiles of the cutting edges are finished to correct involute curvature by a flat face grinding wheel. The flat surface of the grinding

wheel replaces the straight cutting edge of the reciprocating rack-tooth cutter of the Bilgram machines and the hardened roughed-out cutter rolls over the grinding wheel, traveling in a plane paralleling the line of pressure, instead of the rack-tooth cutter—represented by the flat face grinding wheel—traveling from side to side of the cutter blank, as in generating a gear by the fundamental shaper method.

The principle involved is the same as in the reciprocating rack-tooth cutter method of generation, the basic principle of gear tooth generation—see Fig. 3.

Comparing the respective speeds of generation by the single, reciprocating, rack-tooth cutter method and the pinion-cutter method, it is quite apparent that the latter method is much the more rapid, for several cutting teeth—usually three—are in operation at the same time, against one cutter in the less involved method and there is no necessity of back-indexing. The several engaging cutter teeth are not removing metal uniformly, it is true, and the single rack-tooth cutter does not remove the same weight of chip on each operating stroke, but the total amount of metal removed by the pinion-cutter per stroke —several cutting teeth functioning—is considerably greater than that removed by the single cutter, even when the latter is most effectively working. In fact, the machining rate of the reciprocating pinion-cutter exceeds that of a rotary formed cutter machining one tooth space at a time, despite the fact that the former method employs an intermittent cutting action, while in the latter the machining is virtually continuous when the cutter functions.

In connection with this question of relative productivity, however, it is a point of interest that in the manufacture of the pinion-cutters the generating method is not employed to rough out the pinion-cutter blanks preparatory to the hardening process. The roughing is done with rotary formed cutters that leave the excess metal to be removed subsequently by the generating grinder, after the roughed-out blank has been hardened. The reason for this apparent condemnation of the generating method by strong advocates of the principle is that the rotary formed cutter removes the metal more rapidly than can the single, reciprocating, generating cutter and, for the roughing-out operation the accuracy of the formed cutter method is sufficient. Rather, its inaccuracy is no drawback, for the process of hardening the cutter-pinion is liable to deform to some extent the profiles of the cutter teeth, making necessary their correction by the precise means of grinding generation.

The Hobbing Method

If it were practical and feasible to replace the single rack-tooth cutter of the Bilgram generating machine with a series of accurately proportioned cutters in the form of a reciprocating rack section of sufficient length and to actuate such compound cutter in a manner similar to that employed for the single cutter—reciprocating across the face of the gear blank and at the same time advancing as if actuated by the rotating gear—teeth of "standard" involute form would be generated on the gear blank in a manner similar to that performed by the reciprocating pinion-cutter of the Fellows shaper method. The resulting gear teeth would be identical, correctly modified to avoid interference and precisely generated at a high rate of production.

Such a generating machine would not be practical, however, but a hob, which can be likened to a "spiral rack," can be substituted for the series of rack-tooth, reciprocating cutters and exactly the same result secured. This is the principle of the hobbing method of gear tooth generation, based on the same fundamental laws as govern the accuracy of the pinion-cutter method and of the simple, reciprocating, rack-tooth cutter of the Bilgram spur gear generator in cutting gears with such a number of teeth as are not subject to involute interference. The rotating hob is fed across the face of the blank, or the work fed past the revolving hob, the angularity of the cutting planes of the hob—the tread of the hob—paralleling the axes of the advancing teeth generated on the gear blank. If the hob is fed across the face of a blank mounted so as to rotate on its axis in a fixed position, the operation is the equivalent of actuating a gear mounted on a fixed axis by an advancing rack, the basic principle of gear tooth generation as represented by the Bilgram gear-generating machine. If the work travels while rotating and the hob remains in one position, the operation is similar to rolling a gear over a stationary rack, the principle employed in generating the pinion-cutter for the Fellows gear shaper, and the result secured is identical, for it is immaterial whether the rack or the pinion is the actuating member of the combination.

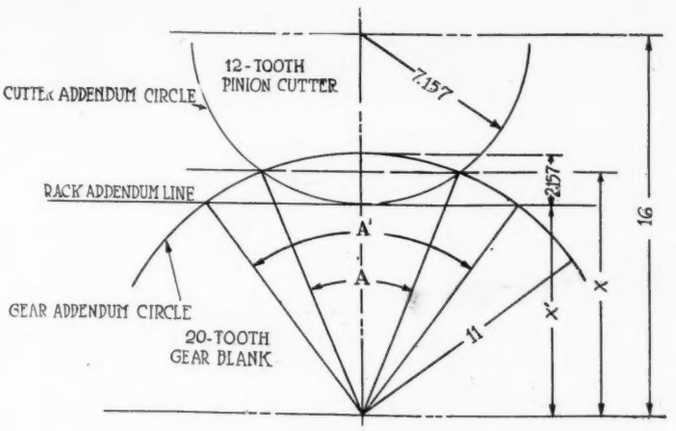


Fig. 4

The hob presents several sets of cutting edges, functioning with greater or less effectiveness at the same time, and so possesses the superiority in rate of machining of the pinion-cutter but in even more marked degree. Disregarding the relative speeds of milling and shaping operations, the productivity of the multiple cutting edge tools is dependent upon the cutting arc of contact between the work and the cutting tool. In the case of the pinion-cutter machine, the curvature of the paths of the work and the tool when machining an externally meshing gear are opposed, so the arc of cutting contact is dependent upon the ratio between the diameters of the cutter and the gear blank. In the other case, the pitch line of the hob being straight, the arc of contact is affected by the diameter of the gear blank only and is consequently considerably greater, the diameter of the gear blank being the same in either instance.

The hob possesses also the continuous cutting capacity of the mill, so it is obvious that, with a materially larger arc of cutting contact and the avoidance of the idle strokes of the reciprocating tool, the rate of production by the hobbing process must be much higher than by the reciprocating pinion-cutter, shaping method. A specific case will perhaps better illustrate this point.

The diagram shown in Fig. 4 depicts the difference in the cutting arc of contact when cutting a 20-tooth gear with a 12-tooth pinion cutter and by the hobbing process. The superiority of the latter method in respect to arc of cutting contact is some 65 per cent. Now suppose the face of the gear being generated, or the aggregate width of a number of narrow gears being machined at the same

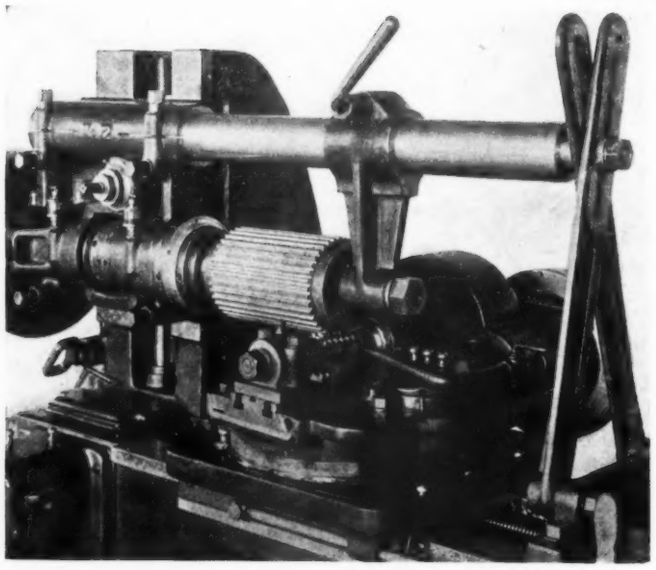


Fig. 5—Hobbing seven spur gears (horizontal class gear hobbing machine)

time, is equal to 6 in. The rotating speed of the hob is customarily between 50 and 250 r.p.m., so an average speed of 150 r.p.m. may be assumed to be typical and suitable for cutting the gear in question. The number of strokes per minute of a pinion-cutter shaper on such a job is also in the neighborhood of 150, so when generating the gear of 6-in. face the cutting speed (effective) of the reciprocating tool is about 75 ft. p.m. The standard diameter of hob for one well-known line of gear-hobbing machine is 4½ in., which, if used in the present case, would give a hob-cutting speed—hobbing being virtually a continuous operation—of close to 175 ft. p.m. With a cutting arc of contact nearly 65 per cent. greater and a cutting speed approximately 2-1/3 times that of the pinion-cutter, it is quite evident that the production by the hobbing method would be much the more rapid. The ratio of productivity might not be as great as 3.85 to 1, but there can be no question as to superiority of the hobbing machine from a purely productive standpoint.

Development of Gear Hobbing

In fact, it has been the unprecedented demand for the accurately cut gears required for automobile and tractor transmissions, typewriters, adding machines, change gears for machine-tool drives, phonographs, speedometers and the many mechanisms of precision now manufactured on a large commercial scale and calling for intensive "quantity production" that has brought about the development of the gear hobbing machine. The requirements for securing high rates of production in accurate cut gearing were well brought out in a paper read before the American Gear Manufacturers' Association in April, 1918. Therein they were listed as:

1. Continuous cutting action,
2. Generation of each tooth by a single tooth or tooth profile,
3. Distribution of cutting action around the blank to avoid localized heating,
4. Continuous indexing by rolling, so as to assure accuracy in spacing—impossible by intermittent methods.

It would appear that the hobbing method of gear-tooth generation exactly meets these specifications, for hobbing is to all intents and purposes a continuous milling process and each tooth space is generated by one set of the hob-cutting teeth. The rapid rotation of the hob and the gear blank assures a distribution of the heat developed in machining and insures against localized heating or excessive expansion. Indexing is a continuous operation, for each revolution of the hob spaces out a tooth on the rotating gear blank and there is no call for the indexing

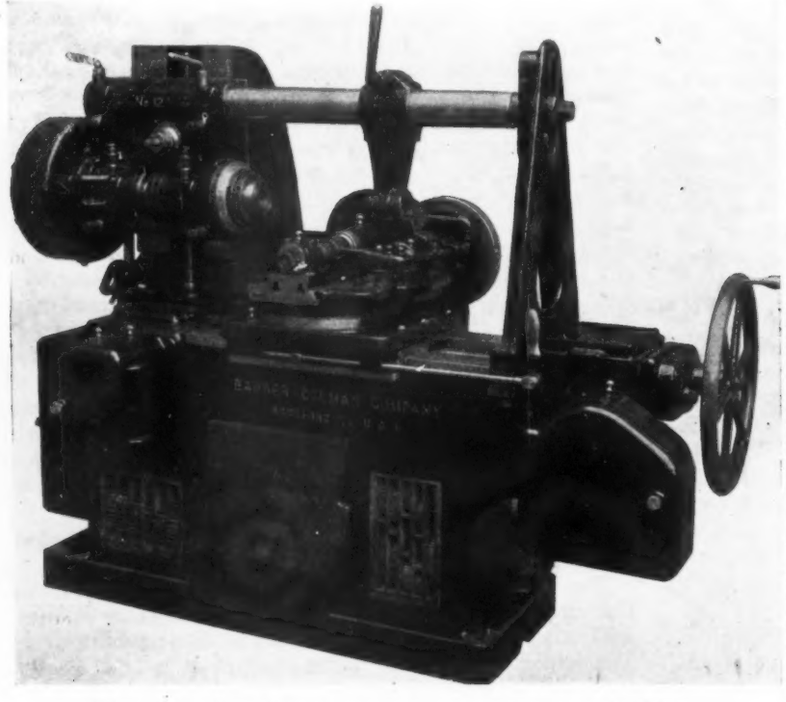


Fig. 6—Barber-Colman (horizontal class) gear hobbing machine (hob travels)

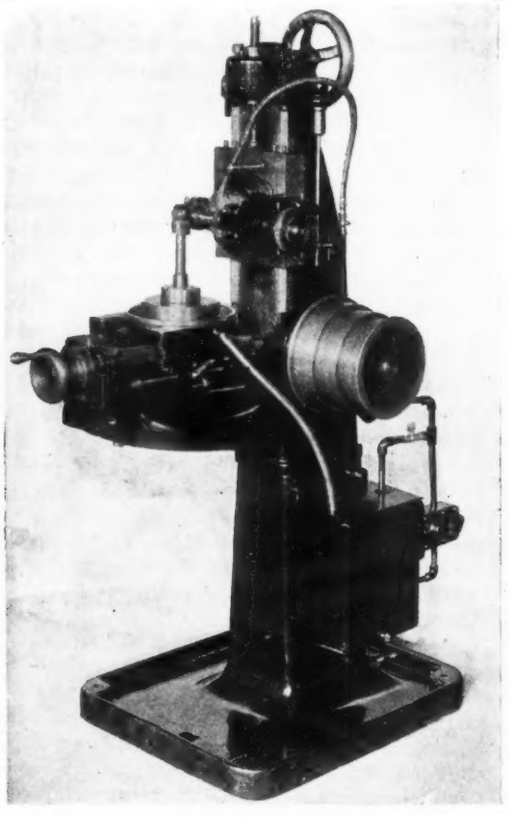


Fig. 8 — Hercules (vertical class) gear hobber

mechanism to withstand such shocks and jars as are developed in the intermittent method of shaping, or planing.

The indexing of the gear blank in the approved type of hobbing machine is through, or harmonious with, the driving mechanism of the hob, so that the ratio between the hob speed and work indexing is synchronized. Should the hob slow up on encountering a hard spot, the indexing of the work is correspondingly retarded, maintaining the proper relation between hob speed and the advancement of the work under all conditions.

The value of the hobbing method was first recognized for roughing out gear teeth, but it was discovered that teeth could be finished by the same method with a high degree of accuracy, using the ordinary polished hob correctly centered. That is, for the ordinary run of work, satisfactory accuracy of tooth was obtainable with standard gear hobs and the refinement of the use of "ground hobs" only required for extremely precise gearing, if necessary even for such delicate work.

Accurate hob manufacture is no sinecure, but the double operation entailed in forming and generating pinion-cutters is avoided by the shape of the hob tooth. In the case of the pinion-cutter, the teeth are bounded by involute curve profiles which are apt to warp and distort on cooling, if hardened after being generated to true profile curvature, necessitating leaving the excess of metal to be removed by grinding generation after the heat treatment of the cutter. The section of the hob tooth—the straight-sided rack form—is such that there is a maximum of metal within the bounding periphery, so distributed that the tooth can be brought to a high temperature and then cooled without developing distortion or unbalanced thermal strains. The result is that the profiles of a gear hob when polished after cooling are as precise as before heat treatment. The hub of the hob is more liable to distortion from the hardening process than are the teeth, so the hubs of high grade gear hobs are trued up by grinding.

Hobbing Machine Classification

The principle of gear hobbing being basic, the logical classification of gear-hobbing machines is by design, rather than by any marked difference in operation. The natural differentiation is then whether the machines are of the horizontal type, carrying the work axis in a horizontal plane, or of the vertical type, resembling more the boring mill construction. Obviously both arrangements can be, and are, employed, for a gear will function in any plane. There is also one other marked difference in the construction employed by different manufacturers, whether the work travels or the hob. Theoretically, it makes no difference which of these members travels, and both schemes are utilized in gear hobbers of the horizontal class. In the vertical class, it is the hob that travels, except when generating worm wheels, in which operation there is no travel of either the hob or the gear blank, once the cutter has been fed to depth. This is equally true for both classes of gear hobbers.

Whether it is more advisable for the hob or the gear blank to travel cannot well be discussed in a paper of this character, but a few remarks should be made concerning points in design that affect the quality of the machine output. Such special features of merit as may be possessed by the hobbing process of gear generation in commercial manufacture are governed by the requirements for productive gear cutting of precision, so points of design must be appreciated and may be properly referred to.

Two essential points in the design of gear hobbing generators must be kept in mind, if the relative merits

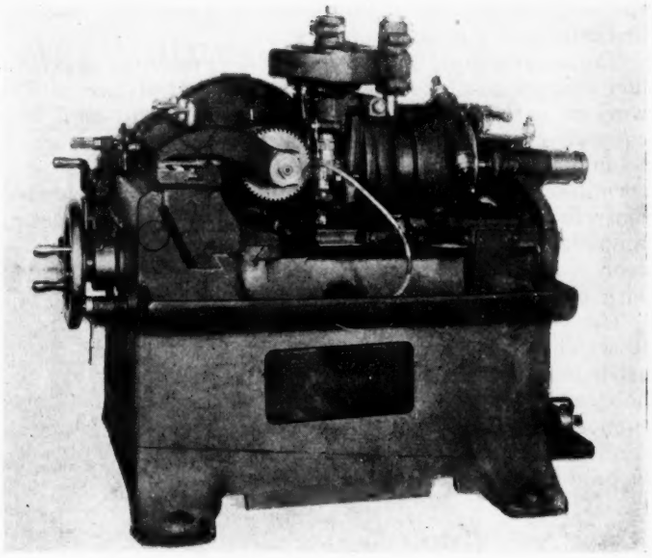


Fig. 7—Lees-Bradner (horizontal class) gear generator (work travels)

of various constructions are to be judged without bias. In the first place, rigidity of machine is important, for the generation of the involute profile and its necessary modifications to avoid interference and to secure the uniformity of output required, for interchangeability of gears is an operation of precision. It takes only a small amount of play to depart considerably from the true profile of a curve of progressive curvature. The second essential is that the cutting speed and the travel of the work or hob be synchronized, for otherwise faulty—meaning really unsatisfactory—output is bound to result.

Supporting the work on a horizontal spindle—the horizontal class of machine—requires, in the first place, that the blank have a bore of relatively large size for the pitch of the gear to be generated, as the torsional stress developed in the work spindle—unless some driving connection can be made nearer the periphery of the gear, a type of driving dog—is unusually heavy. It is good practice, for machines in which the travel is done by the hob, to provide a substantial bar paralleling the axis of the work from which a stiff steady-rest may be adjusted to support the outer end of the work spindle. In clamping the steady-rest to the guide bar, care must be exercised, however, to maintain accurate alignment of the work spindle.

Likewise, in the type of horizontal machine in which the work travels and the hob rotates in a fixed position, the work carriage should be substantial and accurately fitted to its ways, for the tendency of the hob is to force the work out of mesh.

The thrust developed in the horizontal class of gear hobbing machines parallels the axial direction of the gear teeth in the plane of generation and is usually, therefore, more or less horizontal. Being unbalanced, it has to be absorbed by the frame of the machine, necessitating a heavy and well-proportioned construction for a relatively small machine tool.

The synchronizing of the cutting speed and travel, in either the horizontal or the vertical class of machine, necessitates that the work and hob spindles be geared in series—not in parallel—for the blank and the cutter must run as a unit, if accuracy and uniformity of output is to be realized. The drive of the index must respond to all influences affecting the cutter drive. If the hob should encounter a hard spot or its speed be retarded or increased by any cause, no matter how slightly, a corre-

sponding adjustment of the indexing is essential—secured instantly and automatically.

The approved design for the vertical machine is a rigid box column construction with a substantial base. The work is carried on a face plate of the boring mill type supported by a powerful bracket on the main vertical column and the hob travels in a vertical plane on ways forming part of the main column, the feed of the hob controlled by a heavy central screw. This construction simplifies the design, the vertical machine occupies less floor space than the horizontal and rigidity is secured with considerably less weight.

The work rests naturally on the horizontal face plate, to which it may be clamped firmly or held on a vertical arbor that can be stiffened by a simple arbor support. The hob carriage travels on vertical guides and is further supported, guided and stiffened by the actuating central screw, acting as a jack. The weight of the moving mass is productively utilized during the functioning travel of the hob. The thrust developed in hobbing, being in a more or less vertical plane, is absorbed by the base of the machine and its foundation, first being partially counterbalanced by the weight of the moving parts.

Another feature of the vertical construction worthy of attention is that, as the direction of cutting is from the upper to the lower side of the work and the hob revolves in an anti-rolling direction so far as its passage across the work is concerned, the chips are thrown from the cut and drop free from the hob.

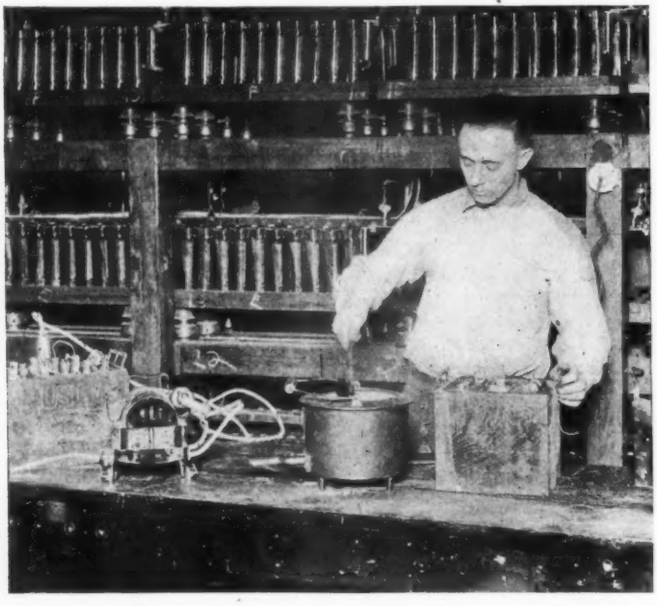
There are, of course, numerous details of construction in both horizontal and vertical machines, refinements, special attachments, etc., that have not been touched upon, but the main requirements and outstanding features of the two classes of machines have been pointed out in order to complete an exposition of the hobbing method of gear generation by laying some emphasis upon the mechanical considerations affecting the attainment of the goal of productive gear-cutting by such means.

Electric Melting Apparatus

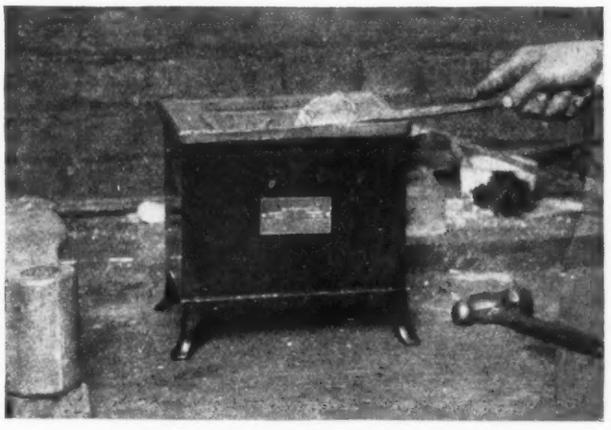
THERE has recently been developed an electrically heated pot for melting battery compound and other compositions of like nature. The heat is provided by a 3-heat unit of the well-known cartridge type, which is inserted in a slot at the bottom of the pot. This unit is regulated by a three-point plug switch for obtaining three heats, and does not require any attention from the operator.

Thus, a uniform, well distributed heat is assured, and the danger of fire from overheating, and of cooling from insufficient heat, during the operator's absence is eliminated. If the operator is called away, he may leave the pot without any fear of its contents catching fire, and while the heat is sufficient to keep the compound in a molten state it is not enough to cause combustion.

The pot is said to be as nearly foolproof as such a device can be, which should be a subject of consideration for those familiar with fires caused by the careless upsetting of compound into a flame, or of going away and allowing the compound to catch fire through forgetfulness. The device is made by the General Electric Co.



Electrically heated pot for melting battery compound



General Electric Bench Type Metal Melter

Another electrically operated melting pot made by the General Electric is intended for melting lead, babbitt and similar metals, and is known as a 25-lb. electric melter bench type pot. The device is designed to eliminate the loss of time and material and to reduce the fire risks which frequently accompany metal melting.

The pot has four short legs, so that it may be stood on a table or floor, without fear of upsetting, or lowered into a recess so as to be flush with the top of the table. The heating element is a coil, insulated from the outside, and wound around the container from top to bottom to insure an even distribution of heat through the contents of the pot and to prevent loss from radiation.

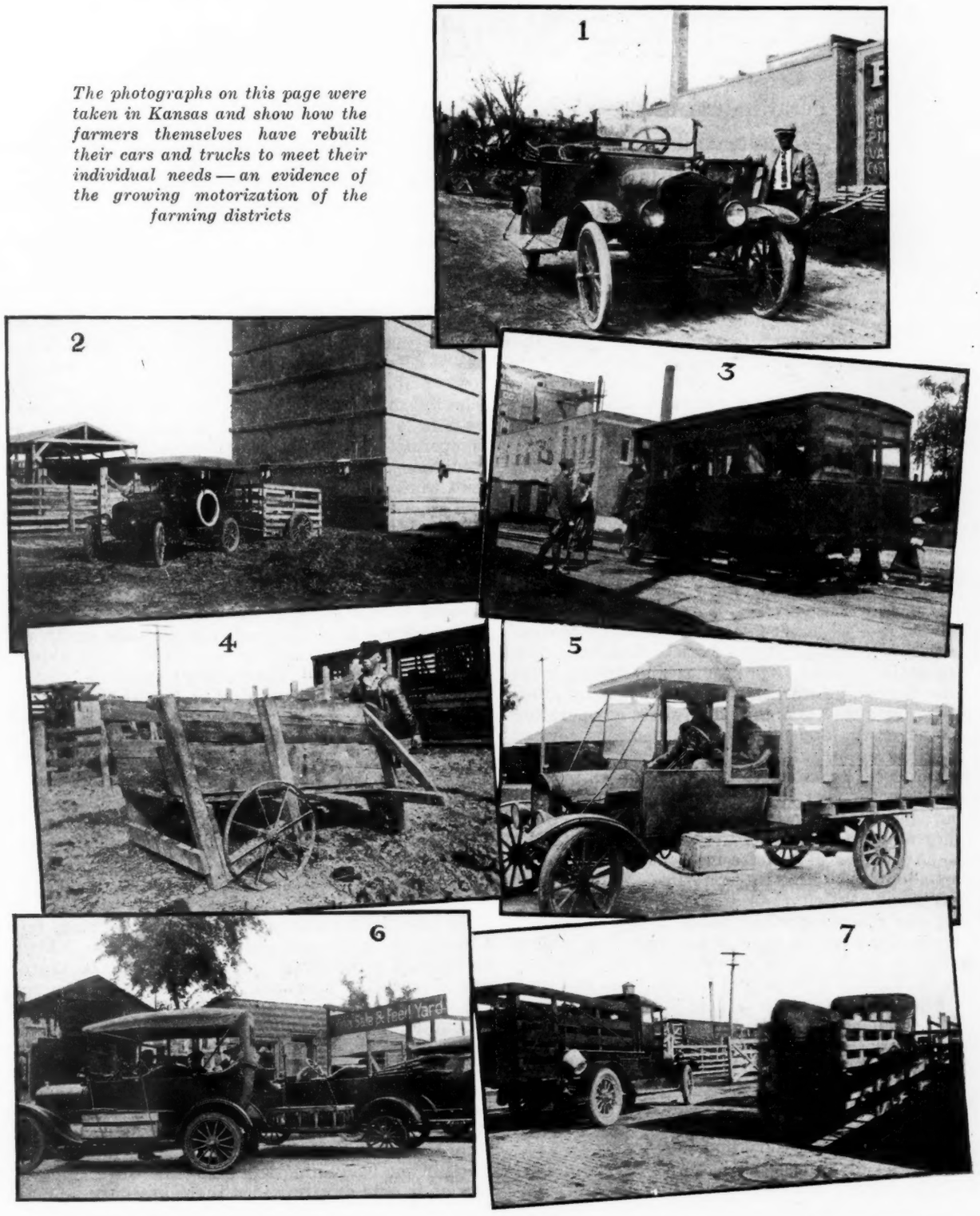
A feature of the device is the automatic regulation, which depends upon the fact that, as the temperature of the coil rises, the resistance rises proportionately, thus diminishing the current and reducing the supply of heat. The initial rise of temperature is sufficient to melt cold metal quickly, whereupon the current drops automatically and prevents the burning of the metal, at the same time retaining it in the molten state.

The automatic heat regulation enables the operator to leave the pot, when necessary, without fear of fire. Also, the thick scum of oxidized metal which would result from overheating is practically eliminated.

GRIPPER & SIDE GUIDE

Farmers' Machines Meet Agricultural Demands

The photographs on this page were taken in Kansas and show how the farmers themselves have rebuilt their cars and trucks to meet their individual needs — an evidence of the growing motorization of the farming districts



1. *Note the home-made drop board.* 2. *An improvised stock trailer.* 3. *A Reo truck carries passengers on a Kansas railroad.* 4. *A portable chute for unloading stock from trucks and trailers.* 5. *Improvised stock body.* 6. *Carrying chickens.* 7. *Similar to* 5, *home-made bodies for carrying stock*

GRIPPER & SIDE GUIDE

Winning the Worker to the Time Study Plan

The general hatred of the machine operator for the time investigator is almost an industrial tradition. But careful methods, prompted by the proper spirit, will eliminate at least a large part of such feeling. This article relates how one company evolved a study department that has obtained a large measure of good-will from the workers.

PIECE-RATES maintained despite large individual earnings, a highly capable department personnel and careful and accurate studies, comprise the chief factors of success for a thoroughly effective time study department. Though some of these factors are difficult to obtain in the fullest degree, their value and practicability are attested by the results obtained in one large automobile plant.

The time study department developed at the Hudson Motor Car Co. comprises a number of distinctive features which make it an excellent example of the possibilities of this part of a factory organization. While the work accomplished by this department is particularly effective, it is exceptional in the spirit behind its work and the thoroughness of its operation rather than in distinctive innovations or new methods.

The first thing of interest is the fundamental conception upon which the scope of the work is founded. The basic purpose is to make time studies and adjust rates that will be fair to the workman and the company alike, and to do this in a way to obtain the fullest co-operation of both management and operators as a means toward obtaining the greatest ultimate production. To fulfill this mission in a highly effective way is a difficult task, as will be witnessed by every person who has been involved in making piece-work rates and maintaining them so that they are satisfactory to the company and to the workmen. A number of definite methods and practices have been adopted by the Hudson time study department in its successful effort to meet the conditions.

Probably the most important policy is that of never cutting a piece-rate when once it has been set, unless some change is made in the operation. This rule applies both to individual rates and to the rates assigned to gangs whose final product is paid for at piece-work rates. This fundamental rule having been laid down, exceptionally careful work is necessary in the study department if the rule is to be carried out without injustice to the company. Piece-rates hastily or carelessly set might easily be so incorrect that the company would lose money on increased production. With such a policy to be carried out, it is necessary that the studies be made accurately in the first place so that, regardless of how much the man is able to produce, his increased production means increased profits to the company.

With this thought in mind, the personnel of the department was given particular study. The time study men in this plant must be able to do much more than time an operation and list the results on a sheet of paper. They must, first of all, be expert mechanics; they must be capable of setting up and running any of the operations themselves; they must know at least as much about the job as the foreman.

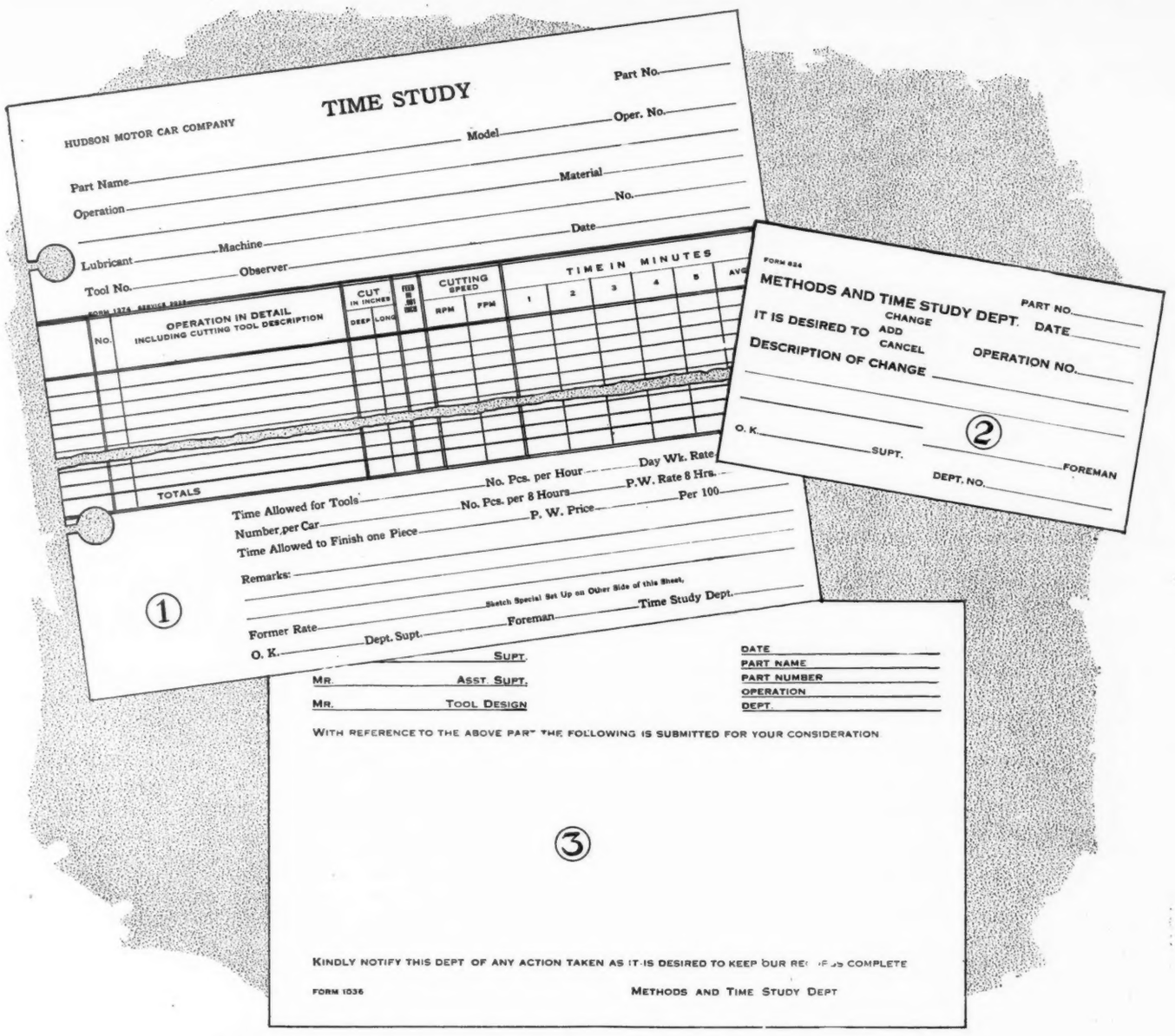
They must be able not only to understand thoroughly the particular job they are studying, but also to see that job in its relation to the entire production scheme. Finally, they must be tactful and diplomatic; they must be able to talk to an operator in such a way as to get his co-operation in making the study. Since they are expert mechanics, they can command the respect of the intelligent workman because they talk to him in his own terms and in his own language. They must also be able to talk to him as man to man, that no antagonism or ill-feeling may arise. Difficulty was experienced, of course, in filling the department with men of this kind, but constant effort and conscientious training have finally developed such a group of trained workers.

From a mechanical standpoint the time study made at this plant is particularly excellent. The study man knows the tool feed, the cutting speed, and the cut in inches at which the particular machine is capable of doing its best work. He regulates the machine with this in mind and thus is certain in making his study that the time taken will not be made inaccurate by a faulty regulation of the machine. He then analyzes the operation and lists the various details on a form similar to that shown in Form 1. The operation is then timed, just as in any other plant, and the results recorded on the form.

As in many automotive plants, a basic day rate is allowed the man. He receives this if he is not able to make more by the piece-work rates. The rate is set here, however, with the average man as a basis. This is not so difficult to do when the time study man thoroughly understands the operation he is timing for, by regulating the machine so that he knows it is giving maximum production, the movements of the workman himself are the only variables in the actual operating time. When the operation has been timed, certain allowances for tool trouble, etc., are made and the piece rate is then established as a result of this careful study.

The record of every study is kept on file as a permanent record. That study, having been carefully and properly made in the beginning, will be as correct ten years from now as it is to-day, provided there has been no mechanical change in the operation. Thus, if an adjustment of rates is necessary later, it can be made in the office on the basis of the original study.

When the piece-rate is computed, it is, of course, set at a figure that leaves a margin of profit for the company on each piece produced. Thus, regardless of how much money the man makes, the company is glad to have him



Forms important factors in the development of an effective time study department
Form 1 is used to record actual time studies, Form 2 to carry requests for investigation to the time study department, and Form 3 to bear recommendations for change from the time study department

increase his production still more. With a carefully made time-study, however, adjusted to the average man, the rates will enable only an exceptional man to make more than his fellow-workmen—chiefly because, as noted above, when the machine is properly adjusted by an expert, the margin for error and variation is reduced greatly.

The machine, in short, is the major factor and, when properly adjusted, will yield about the same production for any ordinary workman regardless of his individual efforts. Exceptional men are very occasionally found who can "beat" the estimated average earnings by a considerable amount. Such men act rather as an added incentive to others than as a means of breeding discontent, because they are allowed to earn all they can without a cut in rates. Thus, the average workman is given confidence to do likewise, with the assurance that his rate will be maintained. Such cases must necessarily be rare, however, when the time study is properly made and the rates equitably adjusted.

It is evident that a time study such as this must be made with the knowledge of the machine operator. Two very practical reasons dictate the use of this method:

(1) It is subversive to obtaining the co-operation and confidence of a man to attempt to time him behind his back.

(2) It is impossible to make a careful and accurate time study without investigating the set-up of the machine and its parts.

To the operator, the time study man is a representative of the company and, when the latter does his work behind the operator's back, he is invariably found out and the company loses the respect and confidence of that operator. This loss of confidence means that the workman will be suspicious of everything the company does; he probably will question the justice of the rate for the reason that it was "slipped over on him." If the time study was for the purpose of setting a fair rate, he argues, why should it have been taken behind his back?

The chief reason for this all too common practice of

"pulling a watch" on a man when he does not know it is dictated by the fear that the man will consciously slow up while the study is being made that he may be able to earn a great deal each day with a minimum of work. This possibility is eliminated largely in the Hudson system, however, by the proper regulation of the machine. This is the chief feature in production, and experience has shown in this plant that the man's movements can be left to themselves, since they play a minor part in the total time of most machine operations.

The time study man who stands behind a post and attempts to time an operation has been so universal in the past that workmen have come to characterize any time study man by common but not complimentary titles. With this tradition to overcome, the department in this plant set out some four years ago with the determination of setting fair rates by honest methods and of getting the workers with, instead of against, the time study men.

This has been accomplished to a large extent by using as time students only mature men and expert mechanics who can command the respect of the skilled operator. One skilled workman is likely to enjoy dealing with another who is his equal in knowledge; as a result this department experiences little trouble in getting the co-operation and good-will of the better workmen. Difficulty is experienced, however, in the case of men who are supposed to be skilled but are not. A "bluffer" finds his bluff "called." In such cases the time study man demonstrates to him the correctness of the study and he is forced to admit his error. Such expert time setters are helpful, as well, to men who perhaps do not understand the work as well as they might but who hesitate to admit their deficiencies to the foreman.

To develop the time study work along these high grade and efficient lines, it has not been necessary to use a large force of men; in fact, the Hudson department is probably one of the smallest in the country, in proportion to the number of men employed in the plant and the machines and operations to be studied. There are nearly 8000 men employed, while the study department has but twelve men actually engaged in making investigations, three of these acting in a supervisory capacity. This small force is made possible by the high type of men utilized in the work. One man of this kind who knows his job thoroughly from every standpoint is able to accomplish three times as much work as a man less fully trained and less capable of doing the work.

The benefits derived by the production and employment departments from an open and above-board time study system have been demonstrated to be great by the experience of this plant. To begin with, the time study department is thoroughly supported by the management in its effort to give the men a square deal. This support is indispensable. When the time study man goes into the shop he approaches the workmen openly and makes his study without "camouflage." He does not argue with a workman or have trouble with him; any difficulties are adjusted off the shop floor. Every effort, however, is made to have the worker feel that the time study man is there to fix a rate that will be fair to every one concerned.

The general attitude of the workman toward the time study man is one of intense antagonism, suspicion and distrust; this is generally recognized. In developing the department it was felt that such an attitude, although perhaps unjust, was to some extent the fault of the investigators. How well the "good-will" method has succeeded is evidenced by the fact that in only one case during the past few years has a workman definitely condemned the time investigator and this man was finally convinced, by practical demonstration on his own machine, that he was wrong.

On the other hand, the machine operators have come to know that there is a square deal waiting for them at the time study office. As a result, they have gotten into the habit of going to that office with any kicks or claims they may have as regards the justice of rates. When a man does this, his case is investigated thoroughly and whatever the decision may be, it is made known to him, together with the practical reasons.

As a further means of obtaining maximum production, provision is made for temporary rate adjustments. Such adjustments are recorded on a pink slip, similar to Form 1 except as to color. This slip is used in case much exceptionally poor stock happens to be coming through, in case of improper fixtures or similar difficulties. This temporary rate is put through for a specific length of time and the workman is made aware of this fact together with the temporary rate. Should the unfavorable condition continue, the rate may be extended for another definite period. In every case, however, the policy is carried out of putting all the cards on the table before the operators.

Although this time study department is somewhat exceptional in having been able to "get the workmen behind it." the necessity for gaining the hearty co-operation of both foremen and executives has not been overlooked. Form 2 is provided for requests for an investigation and adjustment. This form must be signed by both the foreman and the division superintendent.

Form 3 is filled in by the time study department when it has made an unsolicited investigation and desires to have a certain change. In this way, complete co-ordination of the whole organization is obtained.

No changes are installed or operation inaugurated without the complete information and consent of every one involved. As a consequence, by sincerely cultivating and keeping the good-will of both the workmen, the foremen and executives, the department operates, not—as is often the case—as a means of causing dissatisfaction and trouble but as a positive co-ordinating agency and as a means of securing better and more efficient production.

It is difficult to estimate in figures the ultimate effectiveness of a time study department operated along these broad lines. The effect upon contentment among the men and labor turnover is, however, a definite one. This is illustrated by the fact that in the crankshaft, crankcase and countershaft departments—employing about 120 men—only about three men a week are hired. Before the installation of the present time study department the turnover in these departments was much greater.

A recent survey of a number of prominent automotive plants revealed the fact that one of the greatest causes of labor turnover and dissatisfaction among the workers is the practice of cutting piece-rates when a man has reached a certain earning power. This practice, of course, retards production considerably and, in addition probably causes more ill-will than any other single factor of industrial relationships.

The apparent necessity for rate-cutting arises chiefly from wrong time study methods. A good study in the first place eliminates the necessity for constant re-adjustment and enables the management to deal with its workmen on an open and fair basis. Investigators who make studies at a distance of 20 ft. from a machine and indulge in other inefficient and unethical practices probably lose an infinite amount of money for their firms both in setting rates carelessly and in causing expensive labor turnover.

A Study of the Methods and Operations of Japanning Practice

Part I

Much that is old and unsystematic has clung to the japanning processes utilized in many of the automotive plants in this country. Mr. Darrah sets forth his studies along this line, a comprehensive article being the result. The second part, to be published next week, will describe plants and ovens.

By W. A. Darrah*

WHILE the japanning operation is one of the most important from the standpoint of finish and appearance, it is one of the few manufacturing operations that the average automobile manufacturer carries out on a rule of thumb basis, trusting to traditions that the result will be satisfactory. Possibly the aggregation of chemical engineering, heat application and mechanical problems has combined to cause this condition. The following investigation has been made to systematize the industrial operation of japanning by analyzing the process and placing the various steps on an engineering basis.

The lack of definite knowledge regarding japanning practice frequently begins with the manufacture of japan itself. In spite of the fact that excellent finishes are now available, many manufacturers are following recipes which in some cases are over a generation old.

The average commercial japan usually comprises the following ingredients:

1. Linseed or other oxidizing oil.
2. Gums or pitches.
3. Drier.
4. Color.
5. Solvent.

Fundamentally the average japan consists of a drying oil that forms most of the body and serves as a medium to impart flexibility to the finished coating. Linseed oil is most commonly used for this purpose, although other drying oils may be employed with the proper precautions. Incidentally, the basic cost of the japan is controlled by the quantity of linseed oil employed. The quality (durability and protection) of the japan is dependent also upon the amount and grade of linseed oil employed.

The presence of an excess of linseed oil has a tendency to make the finish less brilliant than normal but gives a thicker coat and greater durability. The surface is also somewhat softer and loses its polish more readily. The protection to the metal is good, however. On the other hand, too little linseed oil is usually compensated for by the addition of more gums or pitches, in which case the tendency of the japan is to be rather hard and brittle, but the finish is brilliant. It is a tendency, therefore, of the cheaper finishes to be rather more brilliant than the higher grade products but the coating is thin, cracks off with comparative ease and the protection to the metal beneath is imperfect.

In some cases rubber has been substituted for linseed oil in certain japans, particularly those employed for the first or priming coat. At the present market prices, little rubber is employed, although the trade name "Rubber Coat" has become established to a certain extent and is frequently used. It appears that rubber acts in substantially the same manner as linseed oil, except that it does not give the smooth finish common to oil. It will be apparent that the function of the oil or rubber is to act as a flexible binder and supply the protection to the metal surface, while the gums and pitches serve to give hardness and brilliancy to the finish.

Most baking enamels are either black or dark colored because of the great difficulty in quickly applying and baking a light colored enamel. Even under the most careful handling the lighter colored finishes have a decided tendency to turn yellowish or brownish. Fading is a common occurrence during the baking of most colored japans and the final result is generally unsatisfactory. Carbon black is employed in the primer coat of many of the black japans with excellent results. Aside from the relatively small use of black pitches or gums, carbon black is the most used coloring material, and is to be recommended.

Driers are frequently added to commercial japans but such practice is not entirely to be desired. The nature and amounts of the drier employed is of fundamental importance, as any substance that subsequently may be attacked by moisture and air must be entirely avoided. The organic driers are probably the least harmful. It should be noted that the conditions under which japans are usually baked are such as to reduce materially the necessity for a drier.

The solvent generally employed is either benzine or solvent naphtha. Benzine is to be preferred, although both materials merely act as a thinning medium and enable the mechanical application of the japan with greater uniformity and with minimum labor. The solvents are, of course, entirely removed during the drying and baking operation and it appears that they do not combine in any way with the materials of the japan. Colloidal protecting substances are frequently added, although it must be admitted that in most cases this is a result of experience rather than design. The substances serve to keep the solid materials in suspension, thus materially

Mr. Darrah is vice-president of the Continental Industrial Engineers.

improving the practical working characteristics of the japan.

As a rule, commercial japans carry about 50 per cent by volume of solvent. It is not unusual to add 15 to 40 per cent additional solvent at the enamelling plant, in order to facilitate handling and application. The exact viscosity of a japan can be controlled absolutely by the amount of solvent (assuming that measurements are at a constant temperature) and this is a point of vital importance from the standpoint of securing a uniform product. It is impractical to advise the best viscosity to employ without a full knowledge of all the conditions under which the japan will be used as well as the grade of product which is desired.

The matter of purchasing japan at present is surrounded with much mystery. General appearance and characteristics will tell almost nothing about the quality of the japan. A trial application and test of the resulting enameled surface is a successful and reasonable basis for selecting japans but it should be kept in mind that the means of application and conditions of baking have an extremely important bearing on the appearance and durability of the product, so that an excellent japan may give inferior results when not handled in the best manner. Further, an "accelerated test" is likely to be deceptive; an actual life test is the only certain basis for comparison.

It has been the writer's experience that most japan manufacturers are conscientious in their endeavor to supply a good grade of product. Unfortunately, competitive conditions are such that the price the consumer wishes to pay is determined and a japan representing the best grade available for that price is submitted. The ingredient having the most basis in determining the selling price (and quality) of the japan, is linseed oil. In many cases the higher quality japans contain more expensive gums while the cheaper japans may even contain shellac and stearine pitch.

Function of Japan

In order to decide intelligently upon the best grade of japan and the best method of applying and handling the material, a brief consideration of the function of japan is desirable.

The original and primary objects of applying a finish to the metal parts were to protect these parts from excessive deterioration and to supply a pleasing appearance to the finished article. In order to realize these conditions in practice, the japan must be weather proof, somewhat flexible, sufficiently thick to be lasting, must have sufficient hardness to prevent excessive scratching under ordinary service conditions and should take on a brilliant finish. In the following discussion, an attempt will be made to indicate how these somewhat contradictory requirements can be commercially fulfilled in an ordinary industrial plant without the expenditure of excessive money.

A fundamental requirement of any plant using large quantities of japan is adequate provision for securing a uniform product. As a rule the japan manufacturer is able to supply a substantially uniform product initially, so that the user can confine his attention (aside from the ordinary inspection laboratory tests on purchasing) to equipment designed to maintain constant throughout his own operations.

Most systems, whether they be of the dipping, spraying or flowing type, will require a very considerable storage capacity for mixed japan (that is, japan plus solvent) and also adequate tankage for mixing the material in use with additional solvent to maintain the viscosity standard. It is desirable to maintain a uniform temperature throughout the rooms where the japan is handled or mixed. Uniformity is the essential feature, but best results appear to be secured when the temperatures range from 80 to 100 deg. F. Obviously, the higher the temperature of the japan, the smaller will be the amount of solvent required to secure a given viscosity. On the other hand, if the temperature of the room and the japan is too high, the solvent has more tendency to evaporate.

Another consideration of prime importance is to continually agitate the japan in all parts of the system. Even the highest grade product has a decided tendency to deposit some of the heavier ingredients on standing. One engineering means of reducing this trouble is to avoid the presence of pockets or undrained pools of japan in any of the piping or tankage system. Entering pipes should end near the top of the tank and exit pipes should be connected to the lowest portion of the tanks. All tanks should, of course, be covered wherever feasible and should expose a minimum surface to the atmosphere in case it is impractical to cover them. Lights and flames should obviously be kept very far away from all japan equipment.

The Circulating System

The most satisfactory method of agitating large quantities of japan usually involves a circulating system, including circulating pumps, lawns or strainers, mixing tanks equipped with agitating means and a piping system which well may be provided with heat insulation in case the pipes pass through rooms having a lower temperature than that at which the japan is maintained. The mixing and storage tanks well may be equipped with some means, such as hot water pipes, for maintaining the temperature constant, although if the temperature of the entire room is thermostatically controlled this precaution is not always essential. Japan handling systems can be placed underground to good advantage, as this serves to keep the temperatures uniform throughout the year.

Japan usually is applied in one of three ways: Small articles, such as fenders for automobiles and similar materials, may be dipped directly in the tank of flowing japan and after a period of dripping may be carried by conveyors into the baking oven. Large surfaces that cannot be conveniently dipped may be coated by flowing. In this case the japan is pumped through a hose and out of an elongated slotted nozzle, in such a manner that it flows smoothly and regularly over a considerable surface at any one time.

A third method (also used for applying paints) consists in spraying the coating material by a stream of compressed air. This, when properly handled, allows the production of good results, and also permits some control of the thickness of the coat. The application of japan by spraying is, however, attended by serious personal inconvenience, due to the unpleasant vapors invariably resulting, and for this reason labor is relatively expensive and difficult to handle. Some attempts have been made to produce an automatic spray or mist, so arranged that the article to be treated passes through a closed chamber on a conveyor and under these conditions is entirely coated with paint or japan. Control of the speed of travel of the part to be coated offers a rough means of controlling the thickness of the coat. The spraying method is probably more frequently employed in connection with the painting of chassis and similar parts which do not require a high grade of finish.

The amount of japan which adheres to a freshly coated surface is naturally a variable, depending upon other factors. It is, therefore, impossible to make a general statement for all cases, but some instances resulting from actual experience may be helpful. In one instance, covering the enameling of such materials as front guards, mud aprons, runabout shields, tanks, etc., actual practice

indicated a consumption of 1 lb. of japan to each 50 lb. of sheet metal enameled. The metal in this case was naturally a variable, ranging from No. 12 to No. 18 gage. In another instance in which japan is applied (by flowing) to one side of the surface only, an average of about 1 lb. of japan to 180 lb. of metal is employed. In this case the average thickness of the entire surface averaged around No. 14 gage metal. In general it would seem that about 25 sq. ft. of surface may be covered by 1 lb. of japan in one coat, although as pointed out above, this quantity is so closely tied up to innumerable variables that only an approximate estimate can be made. In case a primer coat is applied to the metal, average practice indicates that about 30 per cent additional weight of japan will be required. In other words, because of the numerous crevices which must be filled, the first, or priming coat, requires on the average about 1.3 lb. of japan for each 25 sq. ft.

It should be understood that the figure of 1 lb. of japan for each 25 sq. ft. of surface applies to the dried japan, as is also the case of the value given for the first or priming coat. The weight of wet or liquid japan, which adheres to 25 sq. ft. of surface, will approach 3 lb. After dripping, the loss in weight by this operation will average about 1.75 lb., while the remainder of the loss in weight results from the evaporation of the solvents during the drying operation. In case the primer coat is sanded before the application of the finish coats, the weight of dry japan removed will range around 0.5 lb. per 25 sq. ft. of surface.

As a rule, spraying japan weighs about 7 lb. per gal., while the spraying paint used on chassis and similar parts will weigh about 9 lb. per gal. From this data and the information given above, it is possible to calculate accurately the quantities of japan required for a given production and this data, taken in connection with the figures given in connection with the circulation required, will allow fairly accurate design of the japan handling equipment. The speeds allowable for the travel of japan through pipes and conduits should somewhat exceed the safe speeds for the flow of oil.

The explosive nature of a mixture of air and the solvent used in japan necessitates a careful study of the circulation system (for air) wherever japan is employed. As a rule the danger limits lie between 2.4 and 6.1 per cent of solvent in pounds. In other words, a mixture of 100 lb. of air and 3 lb. of evaporated solvent is extremely dangerous and many disastrous explosions have resulted in the early days of japanning, due to the ignorance of this condition.

It is good practice to maintain the maximum concentration of benzine solvent in air less than 1 per cent by weight, as under these conditions explosions are practically impossible. The above basis of calculating the necessary amount of air circulation is, in the writer's opinion, much more logical than the empirical method frequently employed, of assuming either a given number of changes of air per hour, or a given number of cu. ft. of air per pound of material japanned. The misleading results which the latter method may involve will be apparent when a comparison is made on this basis of the air circulation required for japanning engine flywheels and for japanning automobile fenders.

Cleaning the Metal

It is good practice to clean thoroughly the metal surface before applying the japan coating. While this subject should logically precede the discussion of the application of japan, because of its connection with ovens and heat treatment, it seems logical to include it at this point.

It is, of course, evident that when the metal surfaces leave the presses and the assembly room, they will be covered with a considerable amount of grease and other organic impurities resulting from the shaping and handling. If this material is not removed the japan will not adhere uniformly and the appearance will be very unsatisfactory.

Several methods are used in practice to remove the oil and grease. One method consists in washing the surface with gasoline or other solvent. This method is usually quite effective but, as a rule, requires more labor and greater care. It is not automatic and depends to some extent on the care taken by the operator. This method also involves serious fire hazards, by reason of the explosive gasoline vapors during the drying process and also because of the large exposed tank of gasoline that is necessary. The danger of striking sparks either by friction or from electrostatic causes, as well as the hazards resulting from electric light and power wires, are considerable. The writer has investigated this subject somewhat with a view of adding materials which will largely reduce the fire hazard, and some interesting results have been secured along these lines.

Baking Japan

The second method employed to clean the metal surface prior to japanning consists in burning off the oils and grease with hot air. It has been found that a 12 min. exposure to a temperature of about 500 deg. F., in the presence of an excess of air, will entirely remove the oily materials without adversely affecting the surface. Naturally, the condition of the surface, weight of metal to be treated and many other factors, will enter to affect this operation. The data given above is based on sheet metal surfaces averaging about No. 14 gage. In this case the amount of oils and grease removed averages about 0.3 lb. per 25 sq. ft. of surface. The amount of air employed for circulation under these conditions may be determined on substantially the same basis as employed in the case of japanning practice. In other words, the concentration of vaporized oils should not exceed 1 per cent by weight of the air employed.

A third method sometimes employed uses a needle spray of boiling water or sometimes a large stream of boiling water under considerable heat.

Aside from the matter of compounding the japan, no single factor is as important as the baking process. There are many factors which require careful control in order to secure a durable, hard, elastic finish, having a good appearance. Some of the more important of these factors may be listed as follows:

Time of baking,
Temperature of baking,
Temperature gradient,
Uniformity of temperature,
Air condition in oven.

To understand the relations of the above noted factors, a brief discussion of the action of the japan during the baking operation will be helpful. After the article to be japanned (which for purposes of illustration may be assumed to be an automobile fender), has been dipped in japan, the excess of liquid gradually flows from the surface (called dripping) until a fairly uniform condition has been secured. While in this state the fender enters the japanning oven (preferably carried by an automatic conveyor) and its temperature is gradually increased by the heat in the oven. The first effect of the increased temperature is to soften somewhat the layer of japan, due to the fact that the heat has a tendency to lower the viscosity. In case there are any pores in the coating this action allows them to be filled up. It also results in reducing the thickness of the coat, with the natural

consequence that its durability is somewhat reduced.

The softening of the surface layer is immediately followed, however, by the evaporation of a portion of the solvent, which in turn tends to harden the japan coating. This action continues during the baking period until the solvent is completely removed. At the same time, the linseed oil undergoes a process of polymerization and oxidation similar to the action in drying paints and varnishes. The presence of a large excess of air is of material assistance in hastening the oxidation process as well as in removing the benzine vapors, and thus hastening the evaporation of the solvent.

As the temperature increases further, the gums and resins begin to liquefy and then to give up certain more volatile constituents in the course of forming a hard condensation product.

It will be evident that the resultant product will have a different surface finish, depending upon the relative temperature of the japan and the surrounding air. In other words, if the japan (and the metal surface upon which it is spread) is warmer than the air about it, the polymerization of the oil and the hardening of the gums will take place more or less uniformly throughout the mass at the same time that the evaporation of the solvent is occurring. Under these conditions, the surface will be relatively free from microscopic pits which are sometimes noticed in poorly handled japan.

On the other hand, if the air surrounding the fender is warmer than the metal and japan itself, the surface of the japan will tend to solidify before the interior and even before all of the solvent has been evaporated from the japan layer. One result of this condition is the formation of tiny pores or holes caused by the evaporating solvent forcing its way through the outer layer or skin. These pores may be microscopic in size, but serve as a weak point at which the japan may be attacked by the weather. The pores also may serve to accumulate dust and dirt, thus causing the body of the automobile to have a very unsatisfactory appearance after a relatively short service.

From the foregoing description it will be evident that a means of heating the articles to be japanned, which permits of keeping them slightly warmer than the surrounding air, is desirable. To obtain such a condition appears to be impracticable for ordinary commercial work, but it can be more nearly approximated by supplying as much of the heat as possible in the form of radiant heat, that is, by radiation from hot bodies—in other words, the heating of a japanning oven exclusively by hot air, is not as satisfactory as heating by radiating surfaces. The most practical compromise, considering both the quality of the product and the cost of operating the oven, lies in supplying the necessary heat to raise the temperature of the metal and japan to the desired point, in the form of radiant heat, and at the same time heating the entering air to approximately the temperature of the oven.

Lower Temperature Preferred

As a general summary, it may be said that the lower the maximum temperature employed in baking the japan, the better will be the resultant surface. It will, of course, be evident that a reduction in oven temperature results in an increase in the time of baking, which, in turn, means either a materially larger investment in oven equipment or a correspondingly reduced production.

The japan manufacturers urge the lowest possible baking temperature and the longest possible time, speaking, of course, from the standpoint of securing a durable and generally satisfactory finish. On the other hand, because of the ever-increasing production demands, the tendency of the automobile manufacturers has been to increase the temperature and decrease the baking time. Practice is widely variable in this connection and excellent results are secured with baking temperatures of from 450 deg. F. to 475 deg. F. on the one hand, and in some cases temperatures from 350 to 400 deg. are employed. A temperature of 450 deg. requires a baking period of about 45 min. to secure best results, although in some cases baking may be completed in a 30-min. period. Temperatures from 350 to 400 deg. require a baking time ranging from four hours to two hours to secure best results, although this may be materially decreased under some conditions.

The possibilities arising in connection with a quick setting japan are attractive and some surprising results have been secured. The writer also has given consideration to japans in which the solvent is water and the field opened up is both large and promising.

Temperature Gradient

Extensive tests, as well as theoretical considerations, indicate that the resultant surface will be improved if the baking temperature is increased gradually. The theoretical basis for this condition follows, of course, from the fact that the solvent will be given ample opportunity to evaporate before the polymerization of the oil and the hardening of the gums takes place. Several large japanning plants have equipment for "preheating" the material before subjecting it to the final baking. Steam coils, operated at temperatures ranging from 250 to 300 deg. F., are employed for this purpose. In spite of the theoretical advantages and those shown by tests, it is doubtful whether the preheating principle is of practical advantage and in the case of at least one manufacturer, equipment for this purpose already installed is not employed.

In case preheating is not used, the temperature gradient will be substantially a straight line, increasing rapidly to a maximum at the entering end of the oven (in the case of a continuous equipment) and continuing at the maximum temperature throughout the baking period. It is obvious that uniformity of temperature throughout the oven is of the utmost importance.

It is desirable that the air supplied to japanning ovens should be controlled in some positive manner, as natural ventilation should not be relied upon. It has been the experience of those plants relying upon natural ventilation to maintain the air circulation, that extremely variable results are secured. In these cases the ovens require constant supervision and the rate of production must be varied to compensate for weather changes.

It is unnecessary to remark that the air used for circulation within the japanning oven must be relatively free from dust and as dry as possible. In some plants the precaution of washing the incoming air has been taken, but this does not seem to be necessary under ordinary operating conditions. The advantages of preheating the air to oven temperature will be apparent when it is considered that this course tends to remove a portion of the lint or dust by burning and also materially increases the amount of moisture the air will absorb and thus, in effect, lowers the percentage of saturation.

To secure a high-grade finish, it is customary to apply at least one primer or "rubber coat," followed by from two to four finish coats. The primer coat is usually somewhat thicker than the others and carries most of the pigment (carbon black). The treatment, application and baking of the three coats is substantially the same as regards both time and temperature. The primer coat usually gives a dull or rough finish without hardness or brilliancy, these characteristics being supplied by the finish coats.

An Answer to Bolshevism

Editor, AUTOMOTIVE INDUSTRIES:

AT the battle of the Somme, when American Engineers threw down their spades, took guns off dead Englishmen and licked the living daylights out of the Kaiser's pet shock troops, they simply staged an advance sketch of what they are going to do to Bolshevism in this country.

You have heard it said that a lot of different antidotes could be applied to the invasion of this country by Russian Reds—but the *real* rock those whiskered fellows are going to bounce off is the brain casing of the American engineer—the man who always finds a way where there is no way. This country, as a whole, is a nation of engineers. There is no mechanical difficulty this country cannot solve when it must. Close down every foundry in America and some new mechanical way of doing what a foundry has to do would soon come out of the mind of some American engineer—I am using the word "engineer" in the broadest sense. We have in this country, word engineers, sales engineers, mining engineers, financial engineers—every kind of engineer. (An engineer is anybody who takes raw stuff and makes out of it finished product that does a new service of a needed sort.)

Suppose you stop all the mail trains in this country; how long would it take American business men to get to a point where everything would be transacted by wire, or telephone, or airplane? And if need be, some Yankee would rig up an outfit that would make it possible for a man to wiggle his wrist in New York and with this same wiggle sign a check in San Francisco.

There is nothing indispensable.

Not even American railroads.

We are getting more independent of our railroads every day—

Thanks to high-speed trucks.

THE MIDWEST ENGINE COMPANY,
LON R. SMITH, General Sales Manager.

Does Not Expect High Engine Speeds

Editor AUTOMOTIVE INDUSTRIES:

WE have not carried on any great experiments with our engines in regard to pneumatic tires, but, from such information and observation by customers using our product and from past experience, we are of the opinion that it is necessary to balance the vehicle speed with the engine speed in order to produce a truck that will give satisfactory service for a given length of time, which may be expected on such a vehicle. It is evident that the engine speed cannot be increased beyond the physical properties of the lubricating oils. Furthermore, the higher speed engines will wear themselves out in a great deal shorter time and prove unfit, so you can readily see that it would not be good practice to increase the engine speed to such an extent as to reduce the useful period of same, but it would be more logical to balance the engine speed with the vehicle speed of the truck, together with the physical properties of the lubricating oil.

The writer believes that the developments will bring forth a practice of holding down engine speed with increasing the vehicle speed, by changing the gear ratios and adopting the larger sized engine, for the engine is the most complicated part of the truck and which requires the greatest attention, and it cannot be operated beyond the physical properties, constituting the wearing qualities of any lubricating oil. It is for the above reason we feel that practice will dictate conservative engine speeds, with higher gear ratios for trucks used on average roads, and a greater series of intermediate gear ratios than are now used for pulling through soft roads and grades.

R. J. BROEGE,
Chief Engineer, The Buda Co.

No Departure for Pneumatic Truck Engines

Editor AUTOMOTIVE INDUSTRIES:

THE writer has been conscious of the comment concerning the effect of pneumatic tires on engine design; especially was this noticeable at the truck shows.

There seems to be a tendency to go to the extreme when any radical departure from present practices becomes popularized. It may be so with the appearance of the pneumatics.

Our company does not feel that there will be any change in their engine design, as its present characteristics make it most adaptable to the requirements of pneumatics, so far as speed is concerned.

A glance at the horsepower and torque curves will bear out the above statement, as the peak of the horsepower is shown to rise beyond the present recommendations for truck performance of 1000 ft. piston speed. In fact, for the 6-in. stroke engines, the peak comes at 60 per cent above this. This gives our engine the power and speed to drive its pneumatic tired trucks above the margin of safety for road travel without reduction in the gear or axle.

C. L. COLE,
Sales Manager, Wisconsin Motor Mfg. Co.

Germany's Aerial Losses

FIGURES which have recently been published in Germany go to show that the losses in the German air service during the war totaled 2483 dead and 3327 injured. These losses are made up as follows:

	At the Front.				In Germany.	
	Dead.		Injured.			
	Accidents.	Fights.	Accidents.	Fights.	Dead.	Injured.
Pilots	783	426	1,020	652	430	39
Observers .	176	305	312	425	49	32
Mechanics.	96	19	138	13	40	51

In addition, 159 student-pilots were killed and 247 injured in Germany during the war period.

Moulding Human Relations Out of the Theories of Labor Progress

In this series of articles, Mr. Tipper is patiently endeavoring to wake up the employer to the point where he will seriously attempt to reach a basis of understanding with his workers. This week he disposes of an objection that is commonly made whenever any labor change is broached.

By Harry Tipper

NOT long ago I was talking with a friend of mine over the lunch table. This friend has made quite a success of a compressed fiber that is worked up and used instead of wood for some purposes for which lumber was previously applied. The conversation turned upon the labor question, as it always does, and my friend said, "That's all right, Tipper, your ideas sound very logical but they are, of course, purely theoretical, and do you think the theoretical point of view is going to be of much value under present conditions?"

Having dealt me this blow, he leaned back in his chair prepared to see me vanish under the table.

Without replying to the question directly, I asked him how he came to get into this compressed fiber business.

Well, he said, "You see I had an idea there were a lot of purposes for which small lumber was used and to which purpose other fiber could be devoted more economically.

"But," I said, "I didn't know that you were in the lumber business at any time."

"I wasn't," he interjected.

"That's strange," I replied, "because if you were not in the lumber business, your idea must have been pure theory and you have just explained to me that pure theory is not valuable.

"Well, of course," he said, "the idea wasn't much good until I proved it in facts."

"True," was my answer, "but you could not have proved this practice and made a success of it without having had the idea in the first place. Now," I said, "let's go back to the labor question."

"When I first went into the shop many years ago to learn the practical side of mechanical engineering, as an apprentice, so to speak, I talked with union men with whom I worked and my observations of practices gave me an idea. All through that long experience in factory and construction work, working at the bench, training workers, supervising and superintending factory operations, I was busy collecting information on my idea and, at the same time, changing that idea just as you proved the practical possibility of your fiber idea and changed it to some extent in that process."

I mention this little incident because it indicates a general attitude on the part of men who have secured their positions as supervisors or owners almost entirely from experience. They have forgotten that, back of every growth, back of every discovery, and every improvement which has found its way into practice, there has been the theoretical idea upon which the experiments were based. They have forgotten also that, while the idea was the thing which started them off, their own knowledge of engineering, or mathematics, or production, or marketing was not sufficient, and it was necessary for them to call to their service men whose education had been broader and more accurate in one or another of these branches of industry.

At the time the first experiment so occurred in connection with the explosive motor, the pure theory, that is the idea, of this kind of engine was already in the minds of a number of men. They were sufficiently sure their theory was correct that they were prepared to experiment with it and out of these experiments grew the practice.

Suppose each of those men had said to himself, theories don't amount to much, ideas don't mean anything, it is practical experience that counts, I don't have any experience in this line, I'll wait until the practice is established. We should be without an automotive industry to-day.

Our understanding in the field of human relations in industry is about where the understanding of the automobile was in those days except that, in the case of the originators of the automobile there was no problem, there was only the possibility of a great improvement. In the human relations development in industry, we already have a severe problem and are in the position where we must recognize it and take action on it so that the discussion of theory or ideas in relation to the human side is more important and the analysis of conditions more necessary.

In this case as in all other cases, the theory must precede the development of the practice. The idea must go before its practical application. We have not yet seen enough men among the industrial leaders who have been bold enough to experiment and wise enough to stay with that experiment to permit us to regard the present experiments as conclusive or to draw from them the significance of practical application.

I remember the statement of a very shrewd business friend of mine in the time when a few automobiles were toiling down Fifth Avenue occasionally. His statement was this, "I don't see much future for those things, they are too experimental, they don't work well, they are frightfully expensive and the old horse is much safer—we may have a repetition of the bicycle craze but nothing more."

Something of the same thing is being said now of those few who are bold enough to advance ideas or to conduct experiments in the hope of settling the human relations

problem in their industrial establishments. Many shrewd business men, seeing that the experiments work badly and are not efficient in their operation as yet, have concluded already that there is nothing in them and that they are a temporary fad which will speedily pass away. Other shrewd business men are convinced that they are dangerous, just as large sections of the public yelled against the automobile in the early days and at a still earlier period yelled against the introduction of the steam engine for the same reason.

As the problem presses upon us, however, more men will study it and more men will become bold enough to put their ideas into experiments and stay with these experiments long enough to see them consolidated into practice. What is good in the ideas will be retained and will be developed and what is of no moment will be eliminated in this process.

Of this we must be sure, however, that with many men in and out of industry studying this proposition, with large sections of the population interested in forcing our attention upon it, theories will continue to grow, experiments will increase and the justification of practice will gradually weed out those things which are not valuable and strengthen those ideas which are necessary to the solution of the problem.

But the matter which my friend brought up is a little broader than this and the habit of mind which suggested the matter is a great stumbling block in the way of development. We are constantly forgetting that all practices are based upon and developed from theoretical ideas and that it is just as important to study, analyze and evaluate ideas as it is to study the practice which follows from their eventual experimentation. It is all the more necessary in connection with human relations because there is at present no science of human nature and no set of text books which can provide a groundwork for comparisons in value. Furthermore, there is no basis of common ground between the man whose human expectations are limited to next week and the man who is required to think in terms of several generations.

It has been the historic method, in matters relating to human organization, to theorize for long periods of time before the theories eventuated in experiments and to experiment for equally long periods before the results of this experimentation have consolidated themselves into the practice of human organization. In some cases where the methods outlive their application to the human conditions too long, the experimentation only came by way of revolution with its accompaniment of disorder. Without respect to how the changes in human organization methods occur, human nature develops very slowly in its forward march and for that reason there must be a much longer period of experimentation before conclusive evidence can be collected therefrom. It is for that reason also that wisdom in human affairs cannot be attained by the man who neglects development and who refuses to become interested in conditions which lie outside his own door.

The history of the development of industry in the last hundred years is a necessary preliminary to appreciating the tendencies and conditions of to-day while the significance of these conditions must be determined by theoretical analysis in the absence of sufficient experimentation. This theoretical analysis must be sufficiently clear in the mind of the industrial leader or manager to give him at least as much belief in its eventual value as the originators of the automobile business had in its practical possibility. Unless this is the case, he will be appalled by the difficulties of the experimentation and the patience necessary to consolidate it into actual practice.

Already, quite a few establishments, which were forced into experiments by the proximity of the problem, have allowed these experiments to lapse because they did not provide a solution for the first labor troubles which came along thereafter. The man who has been willing to spend a number of years in building a business to the point of practical profit, has stopped experimenting with changes for the benefit of his human relations within two or three months after they were started because they did not immediately prove themselves a financial success or wipe away all the human troubles.

It is the theoretical discussion of the labor problem to-day, coupled with the experimentations of those who are old enough to put their theories into operation which are the only hope in the solution of human troubles in industrial organization.

No progress can come without this theoretical discussion and without the experimentation from a purely theoretical basis. The idea must always come before the operation, in human affairs as in mechanical things, and the present discussion will be of immense service in clarifying our ideas in respect of the human relations in industry, if we are sufficiently patient to study them and interested enough to analyze them.

Rate-Cutting Fails in England

ALTHOUGH English industrial conditions differ from those of the United States in many respects so widely that they cannot be compared satisfactorily, there is one respect in which Americans well may profit by the experience of the British. Organized labor in England is definitely opposed to and is suspicious of piece work in any form, chiefly because employers introduced it in a haphazard manner and indulged extensively in the economic fallacy of rate-cutting. It is practically an accepted fact that British skilled workers can never be converted to accept the system now.

Far-sighted employers in this country have long ago abolished the twin evils of careless rate-setting and ruthless rate-cutting. The practice is still common, however, among many high-grade firms of the automotive industry. Probably no one factor goes further toward creating labor turnover and bitterness than the cutting of rates when a man has reached a certain production level. The effect is not only to create dissatisfaction on the part of the workers, but to reduce materially the production.

A recent survey of typical automotive plants indicated very definitely that inefficient production and the rate-cutting evil almost always went hand-in-hand. The necessity for rate-cutting should never arise and it is not likely to when proper time-studies are made and when the time-study man takes the trouble to show himself to the workman as a friend rather than as an enemy.

The practice has caused so much trouble in England that the possibility of establishing satisfactory piece-work rates probably has passed. This possibility has not ended in America and the production and financial success of those factories operating their piece-work systems in a spirit of practical fairness proves the feasibility of a square deal in this particular.

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

PUBLISHED WEEKLY
Copyright 1920 by The Class Journal Co.

Vol. XLII Thursday, March 11, 1920 No. 11

THE CLASS JOURNAL COMPANY
Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, General Manager
U. P. C. Building, 239 West 39th Street, New York City

BUSINESS DEPARTMENT
Harry Tipper, Manager

EDITORIAL
David Beecroft, Directing Editor
Clyde Jennings, Managing Editor
P. M. Heldt

DETROIT OFFICE
J. Edward Schipper

WASHINGTON OFFICE
Allen Sinsheimer

BRANCH OFFICES
Chicago—Mallers Bldg., 59 East Madison St., Phone Randolph 6960
Detroit—95 Fort Street, West, Phone Main 1351
Cleveland—Guardian Bldg., Phone Main 1142
Philadelphia—Widener Bldg., Phone Walnut 5601

Cable Address - Autoland, New York
Long Distance Telephone - 8760 Bryant, New York

SUBSCRIPTION RATES

United States and Mexico - One Year, $3.00
Extra postage west of the Mississippi River on account of Zone Postage Law, 0.50
Canada - One Year, 5.00
Foreign Countries - One Year, 6.00

To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order or Register your letter.

Owned by United Publishers Corporation, Address 239 West 39th St., New York; H. M. Swetland, President; Charles G. Phillips, Vice-President; W. H. Taylor, Treasurer; A. C. Pearson, Secretary.

Entered as second-class matter Jan. 2, 1903, at the post-office at New York, New York, under the Act of March 3, 1879.

Member of Associated Business Papers, Inc.

Member of the Audit Bureau of Circulations.

Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907, and The Horseless Age (semi-monthly) May, 1918.

Labor and Production

THE entry of the American Federation of Labor into politics brings about a rather unpleasant situation. The ideal would be for employers to welcome this activity on the part of labor but, of course, the employers, as a class, do not take such a view.

The chief aim of both the employer and the employed should be production and, naturally, all legislation asked by either should have that goal in view. Rather, the fact appears to be that labor believes that, in going into the political field, it is challenging capital (otherwise employees) on its own ground. Labor, in entering politics, will not gain its ideal, any more than past legislation has created the ideal. Not until both labor and capital have reached the point of a common understanding and a common effort to reach the goal of production will legislation approach a solution.

Employers are not now agreed on their needs. At a recent meeting of road contractors, there was a sharp division among these practical men on a point that is closely allied to legislation, but in reality is shop practice. Several speakers had referred with approval to the "bonus" system of wages. They spoke of the general plan rather than of a particular one. But one of the most successful contractors raised an objection. He denounced everything except the flat wage. He called the "bonus" a bribery, and expressed the view that it should be so declared by law. And yet this man was not narrow; he merely did not see this particular point as did his fellows. Later, in talking on the present status of labor, he said:

"When, in years back, I loafed with laborers in bars or other places, I heard much boasting of 'How much work I did to-day.' Now I do not hear such talk. I hear mostly boasts of how little work the man did and how much money he got.

"Also, among employers and others, I used to hear much talk of the man who succeeded in raising 1,000 bushels of potatoes on three acres and little was said about the fact that he got only $500 for his crop. Now you hear much of the man who raises only 500 bushels on that field but gets $1,500 for the crop. The man who raises the money appears to be smarter, in the eyes of the people, than the man who raises the potatoes.

"Labor is not the only element at fault in the present situation. Probably we are all boasting of how little work we did to-day and how much money we got for it.

"We must get back to the other view. We must re-educate ourselves and in doing so we will educate labor. We must get back to production as a measure, not money."

And, when you think it over, this little talk about represents the situation. The lack of pride in achievement is not a monopoly to labor.

Motor Haulage in the Large Cities

NUMEROUS interesting traffic problems affecting truck haulage in the larger cities came up for settlement in the studies preceding the reports of the state commissions for constructing the proposed vehicular tunnel between New York and Jersey City, the plans for which have just been submitted to the New York Legislature. The cost of the tunnel was estimated to be $28,669,000 and it was believed that at least 12,000 tons of freight, principally carried by motor trucks, would be moved through the tube each day.

The report is of interest to the automotive industry for several reasons. One is that it reveals the present development of such traffic in Manhattan and points out the greatness of the future field of the motor truck. In its broader sense, it is indicative of similar conditions in other large cities, the magnitude of which is proportional to the size of each of the cities.

Furthermore, the studies involved in the report took up various phases of such traffic—the elimination from the tunnel of the exhaust gases of the machines, the grades necessary to permit successful operation and the dimensions of passageways that would allow all trucks to pass.

Ventilation, it was found, would be necessary so that the air content of carbon monoxide would not be

greater than three parts in 10,000. The heaviest grade was fixed at 3.52 per cent. The roadway dimensions were placed at 20 ft. width with a clearance of 13 ft. 6 in., although it was shown that the limitations of practically all traffic was no more than 12 ft. 2 in. for height and 8 ft. for width.

Such factors as those taken up by the report are necessarily of moment to the truck industry both of to-day and of the future.

Hunting for Trouble

THE numerous problems and difficulties which the manufacturer meets each day in the normal course of his business seem almost enough to keep him busy without his going about looking for trouble. When asked to make a report to the Government lately of his labor and production difficulties during the war, one manufacturer replied that he was too busy trying to run his business to write a report of his past troubles. This feeling is doubtless shared by other executives, who believe that their time is too much taken up with the current and immediate necessities of their business to spend much of it in thinking about past difficulties or looking for additional problems to solve.

Yet there is a definite necessity for hunting trouble. In the matter of labor, for instance, many manufacturers consider that they have no labor trouble as long as they are able, by one expedient or another, to avoid actual strikes and open hostilities. They are prone to regard labor trouble as an annoying fly to be brushed off with as little exertion as possible as often as it bothers them. One executive of an automotive concern said recently:

"We have had no labor difficulties. At one time two or three agitators appeared in our midst and tried to get up a strike but, as the men are on the whole more highly paid than any other employment here, the agitation died a natural death. The agitators were fired and no trouble resulted."

Such incidents should be viewed as a part of the whole problem of industrial relations rather than as a unit in themselves. It is only too true that ideas are more difficult to "fire" than agitators and, by failing to follow up the firing of the agitators with constructive efforts to gain the co-operation of the remaining workers, the management exposes itself to the danger of having labor trouble which is not apparent on the surface but which is none the less a hindrance to efficient production.

Strikes are the more virulent form of labor trouble; they constitute the breaking out of the disease. The modern industrial physician, like the modern medical man, should seek to establish preventive measures which would make impossible the actual outbreak of the disease. The acute stage of labor trouble, which takes the form of strikes and active demonstrations of similar nature, is not sudden and spontaneous. It is the result of long periods of minor difficulties which find no concerted expression on the part of workmen but which create an attitude toward the management and a spirit throughout the shop receptive to the ideas of the agitator and radical.

Consequently it is necessary for the executive to "hunt trouble." He cannot successfully adopt the policy of "never troubling trouble till trouble troubles him." A spirit of good will and co-operation among the workmen in any plant cannot be built up overnight, any more than an antagonism to the management strong enough to result in a strike can be built up in a similar length of time. If the management puts into operation a constructive industrial relations policy (while no surface indication of the necessity for it is apparent), seeds of discord, which may later be sown, probably will fall on unfertile ground.

It is infinitely more difficult to create that spirit of co-operation and to make it permeate the whole works when the attempt is made merely in answer to a direct outbreak on the part of employees. Under such circumstances it is extremely hard for the management to convince the workmen that the effort is a sincere one and that it is not merely a forced measure thrown as a sop to keep production going.

It is true, unfortunately, that the already busy executive must go into his plant and find trouble before trouble comes to him, if the problem of industrial relations is to be successfully and satisfactorily solved.

Pneumatic Tired Truck Problems

THERE are some interesting engineering problems wrapped up in the design of the large capacity pneumatic-tired truck, and the sooner we get to the bottom of them the sooner we can expect a healthy development of this line of business. It is important that we get off to a good start in this matter, because if we do not we are apt to waste a great amount of effort and money and at the same time delay the realization of the benefits which this improved type of transportation can bring.

It is conceded by everyone who has gone into the matter that it is not possible to put pneumatic tires on trucks designed for solids and obtain the best results. There are a great many manufacturers who are either trying to do this or who are re-equipping old vehicles with pneumatics. However, to get the full benefit of the pneumatic tires, the truck has to be developed from the ground up.

It is not solving the problem to build a truck that will carry the load and make any grades that may be encountered. It is possible to do this and yet spend too much money for gasoline, oil and tires. Quite possibly the factors of safety necessary with solid tires are higher than those that may be used with pneumatics. The tire companies in their experiments have found it possible to cut these factors. A change in the factors of safety means a complete redesign of the chassis, and to successfully embark upon such a venture requires courage and money.

A study of the possibilities of the pneumatic-tired truck should readily supply the courage, and where this has been found and a careful analysis made, the money required for the development and marketing of pneumatic types should also be forthcoming.

Car Exports Grow—England and Canada Best Customers

January Figures Show $832,927 Gain in Cars and $232,171 in Trucks Over December—Gas Engine Shipments Show Resumption of Activity

WASHINGTON, March 3—A continued increase in the exports of automotive products is displayed in the export figures just made public for January, 1920, by the Bureau of Foreign and Domestic Commerce.

Passenger car exports for January numbered 7870, with a value of $8,846,900, as compared with 7213, valued at $8,013,973, for December, 1919, and 2173 cars, valued at $2,916,381, for January, 1919.

Motor trucks likewise show a continued increase with 1721 trucks, valued at $2,727,856, exported in January, 1920, in contrast with 1465 trucks, valued at $2,495,685, for December, 1919, and 917 trucks, worth $2,399,827, which were shipped in January, 1919. Motorcycle exports showed similar gains.

Gas engine exports totaled 7680, valued at $2,514,552, for January as compared with 6512 engines, valued at $2,128,358, shipped in December, 1919, and 6916 engines, worth $5,096,307, shipped in January, 1919.

The United Kingdom was the largest single consumer of passenger cars and motor trucks, taking 1477 cars, valued at $1,652,227, and 574 trucks, valued at $886,205, with Canada second, and New Zealand, Brazil, Sweden, Japan, Peru and Uruguay buying in the order named; Sweden with 374 passenger cars, valued at $541,029; Japan with 323 cars, worth $365,955, and 99 trucks, valued at $130,676, and Brazil with 400 passenger cars, valued at $382,726, were unusually heavy buyers as compared with previous records.

Exports of Automobiles, Airplanes, Trucks, Farm Tractors, Motorcycles and Parts for January and Six Previous Months

	January				7 Months Ending January 1920.			
	1919		1920		1919		1920	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes	.....	.....	2	$29,180	41	$562,600	36	$162,480
Airplane parts	.....	$77,331	.....	43,060	.....	9,217,112	.....	215,266
Commercial cars	917	2,399,827	1,721	2,727,856	6,318	17,037,063	9,786	19,557,044
Motorcycles	541	142,084	2,398	664,288	4,241	1,018,766	16,365	4,513,391
Passenger cars	2,137	2,916,381	7,870	8,846,900	16,482	18,614,487	48,069	52,392,828
Parts, not including engines and tires	.....	$2,406,783	.....	$4,778,626	.....	19,751,407	.....	27,466,653

ENGINES

	Month of January				7 Months Ending January, 1920			
	1919		1920		1919		1920	
	No.	Value	No.	Value	No.	Value	No.	Value
Automobile, gas	508	$65,274	3,259	$539,269	15,203	$2,367,577	20,867	3,145,669
Marine, gas	513	290,504	657	182,497	3,327	1,787,363	5,339	1,912,586
Stationary, gas	1,998	330,224	2,058	291,821	13,555	1,907,499	15,562	2,096,982
Tractor, gas	3,897	4,410,305	1,706	1,500,965	12,323	14,024,784	10,353	9,150,949
Total	6,916	5,096,307	7,680	2,514,552	44,408	20,087,223	52,121	16,306,186

Automotive Exports by Countries

	January				Seven Months Ending January, 1920			
	Cars		Trucks		Cars		Trucks	
	No.	Value	No.	Value	No.	Value	No.	Value
British Oceania	.....	.....	60	$96,470	.....	.....	388	$649,827
Denmark	87	$82,515	21	42,749	1,633	$1,893,887	452	983,552
France	28	128,619	22	44,760	585	794,700	1,282	5,522,841
Norway	82	125,010	35	75,694	1,343	1,690,923	484	970,953
Sweden	374	541,029	.....	.....	1,526	2,088,709	.....	.....
Spain	117	159,466	.....	.....	1,088	1,368,540	.....	.....
United Kingdom	1,477	1,652,227	574	886,205	6,817	7,262,208	1,429	2,145,541
Canada	578	712,220	130	237,403	4,898	5,808,396	1,118	1,870,106
Mexico	229	205,760	65	79,527	1,681	1,399,107	580	689,900
Cuba	266	307,769	83	188,010	1,949	1,997,266	588	1,255,227
Argentine	228	306,602	25	21,672	1,355	1,642,362	102	173,683
Chile	49	82,461	.....	.....	119	186,664	.....	.....
Uruguay	294	241,250	.....	.....	1,069	1,010,974	.....	.....
British India	189	189,378	.....	.....	2,124	2,294,840	.....	.....
Dutch East Indies	236	270,911	76	161,979	835	1,041,840	204	434,132
Japan	323	365,955	99	130,676	1,323	1,278,966	319	412,332
Australia	107	140,132	.....	.....	2,287	2,449,552	.....	.....
New Zealand	439	480,017	.....	.....	2,325	2,603,948	.....	.....
Philippine Islands	348	325,187	62	114,003	1,358	1,471,742	364	526,657
British South Africa	262	299,914	.....	.....	3,296	2,564,611	.....	.....
Brazil	400	382,726	.....	.....	2,679	2,075,290	.....	.....
Peru	294	241,250	.....	.....	1,069	1,010,974	.....	.....
China	126	149,677	8	14,281	449	586,235	101	270,197
Other countries	1,529	1,680,680	461	634,427	7,933	8,555,015	2,375	3,652,096
Total	7,870	$8,846,900	1,721	$2,727,856	48,069	$52,392,828	9,786	$19,557,044

Ford Admits Plan to Build Dirigibles

DETROIT, March 9—Ford Motor Co. officials to-day admitted that the construction of dirigibles for the navy was contemplated by the company. Col. Sidney D. Waldon, chairman of the Board of Commerce, aeronautical committee, and former vice-president of the Packard Motor Car Co., also stated that dirigible construction had been considered in Detroit since last June, when the arrival, landing and departure of the British dirigible R-34 was witnessed at Mineola by the Board of Commerce Committee and other influential Detroiters, headed by Ford.

"A delegation from the Navy Department visited us and said they looked to Detroit because of our confident way of doing big things," said Colonel Waldon. "As a result of their visit the trip to Mineola was planned and the Ford project was the direct result."

At the office of W. B. Mayo, chief mechanical engineer for the Ford Motor Co., it was said the matter was under consideration, but it was declared no definite steps looking to the utilization of River Rouge plant had been taken. It also was denied that Ford had given Mayo instructions to look into the adaptability of the River Rouge plant for dirigible construction.

Dispatches from Washington which prompted the admission from Mayo's office, were to the effect that Ford plans to build a plant and construct a 1000-ft. dirigible without cost to the Government until the ship is accepted. It also was said a Ford agent now is in Germany to purchase a German dirigible and plans for a model.

During a visit of Secretary of the Navy Daniels to Detroit in January he discussed the matter with Ford and visited the River Rouge plant to inspect the facilities for dirigible construction.

TARKINGTON BUILDS UNIT

ROCKFORD, ILL., March 9—The Tarkington Motor Co., Rockford, has let the contract for a new factory building to cost $75,000. The building will be of brick, 78 x 500 ft. It is expected the structure will be ready by July 1.

British Market for Heavy Trucks Closed

Expert Says War Trucks Will Meet All Demands for Several Years

DETROIT, March 6—Timely warning to American manufacturers who had visions of a market in England for heavy trucks is sounded by Samuel A. Wallace, mechanical transport director for London, and Ford distributer in Europe's metropolis. A large market is available for the two-ton truck, but the "closed season" has been pronounced by Wallace on anything heavier than three-ton models.

Wallace is frank in his statement that American products of the heavy type will be barred, relying on the self-preservation adage in support of his stand.

"You see it's just this way," said he. "We have at the Slough (a great war repair depot near London) 50,000 army trucks that must go back into industry. That will mean at least two and a half years. Of course we are not going to permit foreign manufacturers to break into our limited field while we are disposing of that left-over material. There is a market for at least 200,000 two-ton trucks, but we have a corner on the heavy type."

The 50,000 trucks referred to by Wallace were built for the British army and the armistice left the government with what looked to be a white elephant on its hands. It was then officials turned to Wallace, who, as head of the Associated Equipment Co., built a majority of the trucks purchased for war service by the government, and he was made director general in charge of all repairs and reclamation of property from France being assembled at the Slough, chief among which were the heavy type trucks.

So successful has been the effort under his direction that the trucks being placed on the market are equal if not superior to the product direct from the factory. This, coupled with the fact that the price is so low as to preclude the possibility of American competition, gives officials at the Slough confidence in their stand against importations of heavy trucks.

Aside from the fact that Americans are warned against an attempt to create a market in England until the left-over product of the war is disposed of, the type of streets in London and throughout England, in the opinion of Wallace, restricts the market. Streets are so long and narrow, he said, as to make it virtually impossible for trucks of long wheelbase to get into freight houses. Constituting the bulk of the haulage, in- and out-bound freight, therefore, is the problem and can be solved only by the shorter and lighter truck.

Seeks Bus Improvements

Aside from his duties as director of mechanical transport and director of operations at the Slough, Wallace is interested heavily in British enterprises, and a short time ago took over the London Ford service depot at Brook Green, Hammersmith, and control of Ford distribution in London, at a cost of approximately $1,000,000. Associated with him in this is C. F. Lumb. Wallace, whose visit to America was designed primarily with the idea of looking up improvements for the London motor buses, spent several days at the Ford plant.

Wallace predicts the time when a tire change will be but the matter of thirty seconds, or thereabouts. The problem of successful transportation, he said, lies in getting the public to its destination without delay. "The public does not care about your bus or your problems," said he. "The patrons have a definite object in view when they enter a bus, and their demand is for quick and safe transportation to a given point. The time must come, therefore, when a punctured tire or a blowout will be jerked off and a new one substituted with no appreciable delay to traffic.

Minneapolis S. A. E. Discusses Bearings

Representatives of S.K.F., Timken and Hyatt Discourse Merits of Respective Types

MINNEAPOLIS, MINN., March 4—The dinner of the Minneapolis S. A. E. Section to-night for the discussion of anti-friction bearings resolved itself into a three-cornered battle participated in by representatives of the S. K. F. Industry, Inc., the Timken Roller Bearing Co. and the Hyatt Roller Bearing Co. The three types of bearings discussed were ball, taper roller and straight or plain roller. F. J. Rider and J. B. Castino were the spokesmen for the S. K. F. organization, while the Timken and Hyatt products were explained by T. V. Buckwalter and Otto William Young.

Each speaker began his talk with a general description of the particular bearing type his company made and followed this by citing specific instances of applications in cars, trucks and tractors. While none of the speakers came out point blank to the effect that this type of bearing constituted the highest development possible for any design requirement wherein anti-friction bearings are involved, it was easy to see that none was going to cede ground as to relative merits without contest.

There was little time for a general discussion, the entire evening being devoted to talks and rebuttal by the speakers. Practically speaking, no final decisions were reached, and A. William Scarratt of the Minneapolis Steel & Machinery Co. relieved the tension of the meeting by stating that to his mind the bearing question was greatly influenced by design and production of whatever piece of automotive apparatus the bearings were going into. Thus, a tractor, for example, would be designed to meet the requirements of ball bearings in all its parts.

Major Schroeder, Altitude Record Holder, and His Le Pere Plane

These photographs were secured at McCook Field a few hours after Major Schroeder made the new altitude record of 36,020 ft. on Feb. 27. The Moss supercharger, which is credited with having made the record climb possible, is visible just above the propeller hub. It was designed by Dr. Sanford A. Moss and supplied by the General Electrical Co. The plane is a Le Pere type built at the Packard factory

Accessory Makers Association Plans Advertising Council

Preliminary Meeting of All Advertising Managers Set for March 26—Council Would Study Costs and Effects of Campaigns and Strengthen Weak Points

NEW YORK, March 6—The Motor & Accessory Manufacturers' Association has called a meeting of advertising managers and executives of companies belonging to the association for March 26, to consider the advisability of organizing a permanent advertising managers council to function as a central clearing house for constructive co-operative work on advertising problems as they affect the automobile industry.

It is planned to have two or three speakers of national prominence to give brief talks. The first meeting will be in the nature of a preliminary get-together business session.

In calling the meeting H. L. Hemingway, general manager, said:

"A careful study of the advertising phases of the automotive parts and accessories industry indicates that there is a broad field for practical and genuinely valuable work by a council of advertising managers and executives within our association. This should not in any real sense duplicate the work done by the many local and national advertising clubs and associations. On the contrary, it seems desirable, and in some respects essential, to supplement and strengthen these more general activities by bringing together those advertising executives whose problems are substantially the same."

The following are a few of the more important problems definitely presented for the attention of the council:

1. A study of the function of the advertising agency and its value to the advertiser.
2. The determination of the amount of advertising appropriation and the allotment for the various forms of advertising.
3. The relation between sales and advertising departments.
4. Furnishing of dealer helps, electrotypes and advertising literature to dealers.

Would Train Advertising Men

5. The training and development of advertising personnel.
6. New tendencies in the technique of automotive advertising in copy, art work and layouts.
7. The sharing of advertising expense with the dealer.
8. The problem of newspaper publicity sent out by the factory and by the dealer — co-operation with the trade press and with the automobile editors of the metropolitan newspapers.
9. Counting the cost and gaging the result of your advertising.
10. Advertising and sales problems in relation to the automobile shows and exhibitions.
11. Representation in and co-operation with general advertising organizations of national scope.
12. Miscellaneous plans for the elimination of waste in advertising, for reducing costs, for co-operation economy and for improvement and standardization in automobile advertising.
13. Advertising for foreign trade.

It is planned to have a council of advertising managers function through the general offices of the Motor & Accessory Manufacturers Association which will probably inaugurate for this purpose an advertising bulletin service going directly to the advertising managers and directly to members of companies.

These bulletins will cover all advertising matter of interest to the automotive industry and will constitute a medium for the continuous exchange of ideas and experience on important advertising problems.

Commercial Future of Airplane Is Discussed

NEW YORK, March 11—Commercial airplaning, as a science and an industry, is vital to the military and economic welfare of this country, according to the speakers at the S. A. E. Aeronautic dinner at the Hotel Astor last night. This idea was closely adhered to by all speakers and they represented engineering, army, navy, manufacturing and sales. The military men were especially insistent that their development of the airplane as a means of defense would be worth little in a time of danger if the commercial use of airplanes did not develop an industry that would supply the planes and personnel for emergency expansion. The applause of the diners indicated approval of this sentiment.

There was another development of interest on the question of a separate department for military aeronautics. Both Gen. C. T. Menoher and Commander Westervelt represented the army and navy as favoring the development of aeronautics within these two departments. Col. Truman H. Bain, called upon without warning, let it be known that he favored a distinct military department that would work out all defensive problems.

Col. Jesse G. Vincent, president of the S. A. E., presided. The first part of his address was to review the development of the S. A. E. and to appeal to the membership to study carefully all questions presented, as they must recall that the society held a position of power and respect which it must maintain.

Col. Vincent announced that Otto E. Praeger of the Postoffice Department was to have been a speaker but was detained because of illness in his family. In the absence of the expected speaker, Col. Vincent outlined why, in his opinion, mail carrying was the logical employment for airplanes for development of the industry and science, not the least of which was the fact that experience had proved that the present day planes could be operated at or near a profit in this work.

Col. Vincent introduced Glenn Martin as toastmaster. Martin modestly refrained from referring to his own accomplishments in any way but showed a detailed acquaintance with aeronautical language in introducing the speakers. Gen. Menoher described the tactics now outlined for use in the event of a future war. Commander Westervelt told an interesting story of the first flight of a 12-cylinder engine and outlined frankly the type of craft the navy seeks to develop and asked the engineers to think of the problems presented.

George H. Houston reviewed the commercial situation from a manufacturer's standpoint and asked the engineers to give their attention to problems of safety and economical maintenance. Major Maurice Connolly, who this week became a salesmanager, spoke for the sellers. He dwelt on the idea that it was necessary to sell dealers on aircraft as a future development and make each dealer a worker for the promotion of public sentiment. Commodore Charleton, the British Aircraft Attac' e at Washington, was an unannounced speaker. He said that the entire world needed to be educated in the possibilities of aircraft.

Changes in Dodge Staff Are Announced

DETROIT, March 8—Announcement that Arthur T. Waterfall, traffic manager of Dodge Brothers had been promoted to director of traffic, with Preston G. Findlay, freight traffic manager of the Michigan Central as his assistant, effective March 15, forecasts the further announcement that F. J. Haynes, purchasing agent, has been made vice-president and general manager. Formal announcement of the new organization is expected as soon as Horace E. Dodge returns from Florida.

Extend Filing Date on Incomes to May 15

WASHINGTON, March 6.—Corporations have been granted an extension until May 15 as the final date for compiling income tax returns for the calendar year of 1919, by the Bureau of Internal Revenue. Tentative corporation returns must be filed for the calendar year 1919 on or before March 15, 1920. Each return must be accompanied by at least one-fourth of the estimated amount of the tax due, together with a statement setting forth the reason why the return cannot be completed within the prescribed time and a formal request for the extension. Any deficiency in the first installment will bear interest at the rate of 6 per cent.

Harley-Davidsons High in French Test

Take Five Places in Side-Car Class—English Cycles Lead French Makes

PARIS, Feb. 20 (*Special correspondence*)—Out of 70 motorcycles which left Paris for the 1000-mile reliability trial to Nice, only 45 reached the destination under the conditions laid down by the rules.

French machines were in a minority, but they never showed up very brilliantly, for, with the exception of the 250 cc. light class, they only won one first prize.

These trials were based on regularity, hill climbing, silence and brake tests. The highest number of points was won by an English Zenith machine, with a 154.92 out of a possible 200. The best team performance was made by the English Scott machine, which won the President de la Republique prize, and secured second, third and fourth places in the 750 cc. class. These machines are two-cylinder, water cooled, 2-cycle type, and although well known in England ran in France this year for the first time.

The American industry was represented by Indian and Harley-Davidson. The latter, in the sidecar class, finished first, second, fifth, sixth and seventh. One out of the two Indians finished the run, securing the fourth place in its class.

The performance set up by cycle cars was not brilliant, only one remaining in the competition at the end. This was an English Morgan. Other cycle cars, including machines of this make, dropped out during the competition.

The roads from Paris to Nice were exceptionally bad and, although the average speed was only 18½ miles an hour, it was necessary on one of the stages to give the competitors an extra half-hour in order to reach the control.

Official Results of the Trials

250 cc.

Motosolo, Dubost .....127 points
Motosolo, Dupont ..... 93.7 points

350 cc.

Connaught, Greenwood ...141.95 points
Douglas, Colombel .....138.75 points
New Imperial, Horton.....129. points
New Imperial, Rigal.....118.32 points

500 cc.

Rover, Barthelemy .....150.8 points
Sunbeam, Tom Gilles.....139.97 points
A. B. C., Detruche.....135.6 points
Triumph, Gallié .....117.17 points
Sunbeam, Rutherford ..... 98.90 points
Sunbeam, Newman ..... 98.90 points
Blériot, Brunet ..... 68.04 points

Sidecars, 500 cc.

Georges Levy, Guignet....125.52 points
Sunbeam, White .....125.3 points
Rover, Rex Mundy..... 95.06 points
Rover, Psalty..... 74.04 points
Benoit Gouin, Gallien..... 51.82 points

Sidecars, 750 cc.

A. I. S., Douglas Hanker..135.52 points
Triumph, G. Perry.....132.7 points
Georges Levy, Noret.....131.13 points
Georges Levy, Lacour....128.8 points
Norton, Horsman .....128.7 points
Stucchi, Delaunay ..... 87.05 points
Georges Levy, Gompertz.. 85.7 points
B. S. A., Dupuis..... 70.3 points

750 cc.

Zenith, Kay Don.....154.92 points
Scott, W. C. Guy.....149.3 points
Scott, Jesse Baker.....144.5 points
Scott, Tom Wood.....139.6 points
Triumph, Pinney.....136. points
Rover, Dehay.....133.8 points
Triump, Goffrey Hill.....109.04 points
Sunbeam, Sermens .....104.71 points
Scott, O. Wood..... 98.56 points
Scott, Russell King..... 86.03 points

Sidecars, 1000 cc.

Harley-Davidson, Verpault.146.13 points
Harley-Davidson, Bonnard.136.6 points
Royal Enfield, Oblin.....133.8 points
Indian, Etade.....132.34 points
Harley-Davidson, Collot...130.9 points
Harley-Davidson, Mulliman120.49 points
Harley-Davidson, Pletsier.112.1 points
Matchless, Dellané .....105.9 points

Cyclecars, 1100 cc.

Morgan, Chapman .....144.5 points

Winners in the Paris-Nice Contest

Upper—Two Harley-Davidson machines that won first and second prizes in their classes. Lower left—Indian which finished fourth in the 1000 cc. class. Lower right—Zenith, credited with highest score in the trials

DU PONT BUYS PLANT SITE

WILMINGTON, DEL., March 6—The du Pont Motors Corporation, manufacturer of the new du Pont automobile, has bought 8½ acres of land at Moores, Pa., between Wilmington and Philadelphia, where a plant will be erected for the manufacture of cars.

The company will retain the plant here, where the first cars were made, for the manufacture of automobile and gas engines.

Raw Materials Lead in January Imports

Both Branches of Foreign Trade Show Large Increases in January

WASHINGTON, March 6. — The foreign trade of the United States during January, 1920, showed large gains in exports and imports, with the latter increased considerably more than the former. Imports for January, 1920, totaled $473,904,053, as against $212,992,644 in January of last year, an increase of more than 100 per cent. Export figures for January totaled $732,745,493, as compared with $662,552,783 in January, 1919.

The greatest increases in imports were noticeable in crude materials for manufacturing purposes, which totaled $77,757,987 in January, 1919, as against $25,477,159 in January this year. Foodstuffs and completed manufactures ready for consumption show comparatively large gains in the imports.

Crude materials for use in manufacturing made the greatest gain in the exports with a total of $237,477,548 ex-477,159 in January this year. Foodstuffs $137,769,968 in January, 1919. Manufactured articles ready for consumption increased slightly.

Service Managers Division for N.A.C.C.

H. R. Cobleigh to Head New Department—Will Aid in Standardizing Practices

NEW YORK, March 5.—The National Automobile Chamber of Commerce at a meeting held recently voted for the establishment of a service managers' division to function for that department along similar lines to the foreign trade, patents, traffic, legislative, highways and other departments. H. R. Cobleigh has been placed in charge of this new division. It is the intention to arrange for meetings or conventions of factory service managers, planning programs, securing authors for papers and discussing topics of interest and value to the industry.

It will be remembered that the first factory service managers convention was held in Detroit in November of last year and the action of the Chamber a few days ago is simply carrying out the ideas promulgated at that meeting. Many activities will be fostered and bulletins will be mailed to service managers calling their attention to practices needing correction, policies worthy of universal adoption and special efficient systems in use by certain successful factories.

Following the success which attended the visits to member factories at the Detroit convention it is planned to continue such visits and to prepare publicity material to further the efforts of factories to furnish satisfactory service.

The Chamber will co-operate to the fullest possible extent with the National Automobile Dealers Association, Motor and Accessory Manufacturers Association, other national associations and the Motor Transport Corps on all matters pertaining to service.

To Conform School Methods

The Chamber will be of material assistance to branches and dealers by encouraging and assisting in the establishment of local organizations, of dealer and garage servicemen. Wherever possible this division of the Chamber will provide speakers and indicate the direction in which factory and dealers service departments may co-operate to improve the character of service.

A very important work will be in the visiting of great numbers of automobile schools with the intention of standardizing methods to a considerable extent. The division will prepare manuals, based upon research through the field to show how the more common repairs and overhaul operations can be handled with a minimum of time and material. This will not only include the quality of service but will reduce the cost to the service station so that the profit will be greater or the charge less.

This division will also act as a central bureau for the collection and dissemination of information to help other service bureaus and associations in the conduct of their work. It will act as an employment clearing house whose primary object will of course be the assisting the factories but whose work may also be extended to dealer establishments.

With the realization on the part of the manufacturer, designer and dealer of the importance of service work, this step on the part of the Chamber may be considered as highly important.

Portugal Forbids Importation of Cars

PARIS, March 6 (*Special correspondence*) — The importation of passenger cars into Portugal has just been forbidden by the Portuguese Government, and a limit has been placed on the number of trucks which can be taken into that country.

This decision will disturb principally French and American makers, who had orders in hand for Portugal. It is declared that French makers had received orders for automobiles to be delivered this year to the value of $3,000,000 and that a deposit had been paid on all these orders.

DELAWARE INCORPORATIONS

WILMINGTON, DEL., March 6—The following corporations have been chartered under the laws of Delaware:

Ad-Mor-Myler Rubber Co., with a capital of $1,000,000, to manufacture rubber appliances. The incorporators are M. L. Horty, M. C. Kelly and S. L. Mackey, all of Wilmington.

Pennsylvania Automotive Corporation, with a capital of $50,000, to manufacture and sell automobiles. The incorporators are W. N. Lofland, Frank Jackson and Mark W. Cole, all of Dover, Del.

United Tire Stores Co., Inc., with a capital of $10,500,000, to manufacture and sell tires, etc. The incorporators are T. L. Croteau, M. A. Bruce and S. E. Dill, all of Wilmington.

Republic Truck Sales Corp., with a capital of $100,000, to manufacture and sell motor trucks, etc. The incorporators are T. L. Croteau, M. A. Bruce and S. E. Dill, all of Wilmington.

SUNBEAM ENTRIES PLANNED

NEW YORK, March 6—Arrangements for the participation of a Sunbeam team to represent Great Britain in the international 500-mile sweepstakes to be run on the Indianapolis Motor Speedway, May 31, will be made by Dario Resta, Sunbeam representative in the United States and noted racing driver, who is to leave for England in the near future.

Last year the Sunbeam entries were declared ineligible to compete owing to a technical error in building the engines oversize.

CASE ADVANCES PRICES

RACINE, WIS., March 8 — Effective to-day, following are the new prices on Model V 6-cylinder Case cars: 7-passenger sedan, $3,750; 4-passenger coupé, $3,400; 7-passenger touring, $2,650; 4-passenger sport, $2,650.

British Production On Upward Trend

Materials Assembled During Molders Strike Aids in Present Healthy Showing

LONDON, March 6 (*Special correspondence*)—About four weeks have passed since the molders resumed work after a strike lasting some fifteen or sixteen weeks. The result is being seen in an improved output of vehicles, though something, probably most of the credit, is due to there being on hand (accumulated during the strike) stocks of finished components and pieces other than castings. It remains to be seen if the output can be continued at the present promising rate, especially in the case of firms which up to now have ruthlessly neglected all suggestions of getting parts from specialists.

The Harper-Bean group has hit on the interesting idea of publishing a record of each month's output, which probably has been told them by Mr. Conroy (formerly of Willys-Overland), the new production organizer at the Harper-Bean main factory. The output for January was 286 chassis, which is accounted about 25 per cent more than was scheduled in the prospectus of the company's recent $30,000,000 flotation. The factories concerned are the Harper-Bean works at Tipton, the Vulcan at Southport, and the Swift at Coventry.

Nominally this output averages 70 a week between these three works, and despite the company's remark as to its being 25 per cent more than was expected, it is obvious that it is about only 25 per cent of the output required to justify the $30,000,000 capital involved in these and the subsidiary "feeder" factories of the combine. Reports are that Conroy has done wonders at the Bean works in a short while, where he has had to install both new plant and a modern system of progress output.

Meanwhile the Austin company is in the market for a further $7,500,000 capital for financing output, etc. This company's total capital available to be called up is $25,000,000. Production is improving at the works, but at present it is nothing like sufficient to meet the changes in capital. The new prospectus for further capital makes no reference to the position of the recent negotiations between General Motors, Ltd., and the company. Possibly the result of this flotation as a measure of public confidence will settle the issue.

COMPLETES BODY PLANT

LUDINGTON, MICH., March 5—Monroe Body Co. rapidly is getting into shape for production in the building formerly occupied by the Cartier-Chapman Wagon factory. A modern factory building will be erected alongside the temporary plant, as rapidly as the work can be rushed. Three carloads of machinery for the plant arrived in Ludington this week. R. F. Monroe, general manager already has enrolled 150 experienced workmen.

New Handley-Page Continental Routes

London - Paris - Brussels Freight Route Is Established for Valuable Consignments

PARIS, Feb. 4 (*Special correspondence*)—Since the London to Paris and Brussels air services were established on Sept. 2, 1919, until Jan. 29, 1920, Handley-Page machines had carried 924 passengers, 43,412 lb. of freight, and had covered a distance of 65,293 miles.

On May 1, 1919, civilian aviation was established in Great Britain, and from that date until Jan. 29, 1920, Handley-Page machines carried 461 passengers, 44,805 lb. of freight, and covered 74,743 miles.

A new service has recently been established between London, Paris and Brussels for carrying freight at reduced rates. The following is the scale of charges:

Shipments up to 10 lb.	*2/6 per lb.
Shipments from 10 to 20 lb.	2/3 per lb.
Shipments from 20 to 50 lb.	2/– per lb.
Shipments from 50 to 100 lb.	1/9 per lb.
Shipments, 100 lb. and over	1/6 per lb.
Passengers' baggage (unaccompanied by passengers)	1/6 per lb.
Minimum	5/– per lb.

(*At English rates. Shillings equivalent to 25 cents and pence, 2 cents.)

Many valuable consignments have been sent by air between London and Paris during the past weeks. On one occasion a Handley-Page machine carried $17,500 worth of jewels from London to Paris. Among these was a necklace valued at $11,500. Precautions were taken to safeguard the jewels in the event of a forced landing between London and Paris.

Numerous consignments of delicate articles, such as ladies' silk dresses, scientific instruments, antiques, valuable flowers, are now constantly carried by air between Paris and London. Air service is proving itself particularly valuable for this class of transportation, for all danger of damage by rough handling is removed, and the risk of loss by theft becomes negligible.

The Handley-Page Co. is now making use of converted bombers for continental air service. These machines are known as Type W-8, and carry 15 passengers or 2 tons of freight at a speed of 112 miles an hour. The first of these machines was exhibited at the Paris Aero Show, having been flown there from London. On the close of the exhibition this machine was flown back from Paris to London, making the flight in 2 hours 10 minutes. The average time between Paris and London is under 3 hours by air; by train and steamer the journey often occupies 14 hours.

PERU DEVELOPS AVIATION

WASHINGTON, March 6—The President of Peru has published a decree creating a school of military aviation in Peru, and twelve French planes were received in Lima about a month ago. Representatives of both English and American companies are in Lima at the present time, and the purchase of two American planes has already been made by the employees of the Empresas Electricas Asociadas, who seem to have taken the initiative in promoting aeronautics. Recent accidents to both the French and American demonstrators may retard the negotiations for additional airplanes.

It is also reported that the Peruvian Corporation intends to inaugurate a flying boat service between Callao and the summer resort of Ancon, 25 miles to the north. Planes manufactured by Handley-Page are to be used for this service. Flights will also be made between Callao and Salaverry, a distance of 260 nautical miles, by steamer route, which the flying boats can cover in approximately 3 hours. It is expected that considerable traffic between Callao and outlying ports will develop.

Navy Starts Work on Trans-Pacific Airship

PHILADELPHIA, March 6—The construction of the world's largest dirigible airship, which navy officers at the Philadelphia Navy Yard, League Island, believe will make the first non-stop flight across the Pacific Ocean, will be begun soon, the designing to be done at League Island. It will be developed along lines similar to the R-34 which made the successful trans-Atlantic flight. Fifty-two experienced draftsmen have been called for. The dirigible will weigh approximately 33 tons and will have a carrying capacity of 30 tons.

TO OPEN DELAWARE HIGHWAY

WILMINGTON, DEL., March 6—The Delaware State Highway Department expects to have the state highway, from one end of Delaware to the other, 100 miles, with a number of connecting roads, completed by the end of this year. Much work was done last year, when the real start was made and additional contracts will be let in March for large projects this year.

In order to distribute the traffic over the new roads the Highway Department has arranged to keep the roads free of snow in winter as far as possible, at all events where there is heavy traffic. The roads are policed also, to prevent excessive speeding and other abuses.

CONRADSON TOOL EXPANDS

GREEN BAY, WIS., March 8—The Conradson Machine Tool Co., Green Bay, Wis., is effecting a large increase in the output of selective head turret lathes by doubling the working force of its plant, erected last fall. The output of milling machines and radial drills also is being enlarged materially. The entire production has been contracted for by Joseph T. Ryerson & Sons Co., Chicago, which has established an office in Green Bay. For the present the miller is being manufactured under contract by the Green Bay Barker Co., and the drill by a concern at Marquette, Mich., until the Conradson plant is enlarged sufficiently to accommodate both operations.

Blames Railroads for French Inertia

Industrial Delays Due to Transportation Facilities Says Michelin—Favors 8-Hour Day

PARIS, Feb. 20 (*Special correspondence*)—The lack of railroad transportation is the main reason for the slowness with which France is getting back into production, according to a statement made by M. André Michelin, head of the Michelin Tire Co., in an article written for the French paper the "Journée Industrielle."

M. Michelin says that the French railroad material is in a very poor condition at the present time. The train service has never been so bad, and there has never been so much indifference among the railroad workers. There would be no shortage of finished goods if the railroad service were satisfactory. The Michelin Tire Co. would be in a position to meet all requirements if the railroad service was capable of handling the goods ready for delivery.

According to M. Michelin, not only is the material in poor shape, but there is a shortage of skilled workers, and many of the heads of departments are inefficient. One of the reasons for this is the uncertainty regarding the future of the French railroads. Young engineers hesitate to enter a service which in the near future may become a branch of the State departments.

As an instance of this, the Michelin Co. was informed one evening that a freight car was in the depot for them, waiting to be unloaded. When they went the next morning to take delivery of this car, they found that it had gone. This car possessed good brakes, and in consequence, it was used on five long distance trips without being unloaded before the Michelin company could get delivery of it. Such instances are common.

Eight-Hour Day Coming

The eight-hour law is not a mistake, declares M. Michelin, and with proper organization efficient service can be obtained from an eight-hour day, or even in certain cases from a six-hour day. Modern American methods have been experimented with in the Michelin Tire Co. main factory at Clermont-Ferrand, when it was found that with modern and highly efficient machinery, the workers unless specially trained found themselves under a serious handicap. Some of the workers had stated that they would prefer to work longer hours at a less strenuous rate. This is only a question of education and training in order to enable the workers to keep pace with modern machinery.

The fact must be faced that rest centers, such as are known in America, must be available for workers, in order that they may make intelligent and healthy use of their hours of recreation. In order to be advantageous the new methods of work must be accompanied by a long series of reforms.

Would Settle Labor Disputes at Source

Industrial Conference, Completing Studies, Suggests Settlements at Individual Plants

WASHINGTON, March 8—The proper place to grapple with the labor problem is in the individual plant, the second industrial conference will tell President Wilson in its final report. The conference adjourned Saturday after having held eighty sessions since its first meeting, Dec. 1. Its report, adopted unanimously, will go to the President next week, and will be made public within fifteen days.

Specific recommendations regarding hours of work, wages, women and children in industry, unemployment and similar problems have been made, the conference announced, and a definite stand on collective bargaining, the rock on which the first conference came to grief, has been taken.

In a preliminary report made public Dec. 19 the conference proposed machinery for adjusting disputes between employees and employers and asked for criticisms and suggestions. A number of men prominent in public life, as well as representatives of capital and labor, appeared before the conference, while individuals and organizations made suggestions in meeting.

The final report, the conference announced, makes some modifications of the organization suggested in its preliminary statement, but leaves intact the national industrial board and the regional boards of inquiry and adjustment. The final report also deals "broadly with the general field of industrial relations" and undertakes to prevent industrial disputes by recommending elimination to facilitate voluntary adjustments between capital and labor.

While no attempt was made to deal comprehensively with the railway problem because of the recent enactment of the railroad law under which the carriers will operate under the private control, suggestions were made regarding other public utilities.

The report, which contains about 15,000 words, will be printed for distribution.

The conference was composed of seventeen members, with Secretary of Labor Wilson as chairman, and Herbert Hoover as vice-chairman.

WELDING RIGHTS TAKEN

MILWAUKEE, March 8.—The Standard Parts Co., Cleveland, has acquired the Canadian rights to the Lloyd oxy-acetylene method and machinery for manufacturing steel tubing, from the Automatic Welding Co. of Menominee, Mich. The method was patented in 1910 by Marshall B. Lloyd of Menominee. The Standard Parts Co. controls the American rights and now acquires the Canadian rights for use at its big plant in Woodstock, Ont.

TO BUILD LIGHTING UNITS

MILWAUKEE, March 8—The Kohler Co., Kohler, Sheboygan County, Wis., one of the world's largest manufacturers of enameled sanitary ware, has engaged extensively in the production of farm lighting systems of the automatic type. The plant has been undergoing large expansion during the past year with this in view. A new engineering building, 129 x 274 ft., was completed at the end of the year, and work has been started on a large foundry, 220 x 300 ft., the capacity of which will be required mainly for the farm lighting production department.

NEW FOUNDRY PLANNED

SHEBOYGAN, WIS., March 8.—The Sheboygan (Wis.) Machine Co. will establish its own gray iron foundry and has let contracts for the first unit, 40 x 108 ft., with one cupola and an hourly capacity of 5 tons. Alfred Steffen, Jr., is president and general manager.

Giant Airplane on Cairo to Cape Flight

Photo by Kadel & Herbert.

This illustration shows the giant Vickers Vimy commercial airplane which is making the adventurous journey between Cairo and Cape Town, a distance of 5206 miles. It carries 15 people and has 760 hp. It develops a speed of 100 m.p.h. Note the four-blade propellers

House Again Hears War Air Records

Rival Political Committeemen Entertain Members with Continuation of Dispute

WASHINGTON, March 8—The House of Representatives devoted five hours Saturday to the debate of aircraft expenditures during the war, with the Democrats defending and the Republicans condemning the results achieved. Approval was given chiefly by Congressman Lea, while condemnation of practically the entire aviation activities of the War Department, with the exception of the design of the Liberty engine, came from Congressman Magee. The Liberty airplane engine, stated Congressman Magee, was the only noteworthy achievement of the entire program.

Both Congressmen Magee and Lea devoted practically all their time to repetition of the remarks and the statements contained in the majority and minority reports which were recently made public by the committee investigating expenditures in the War Department.

Congressman Magee asserted that the United States spent $1,051,000,000, and had not produced one fighting plane or purely bombing plane, and sent to the front in France for operation but 213 DeHaviland-4 planes, which he asserted are awkward, dangerous machines. At the same time, he stated, Great Britain produced twenty-seven types of one-seater fighting planes, five types of two-seaters, twenty types of observation planes, ten types of day bombers and ten types of night bombers, while France produced thirty-one types of one-seater fighting planes, ten two-seaters, twenty-two observation planes, seven day bombers and four night bombers. Italy, he said, turned out thirteen types of one-seater fighting planes, one type of two-seater, eleven observation planes, forty-one bombers and seven night bombers, and Germany twelve one-seater fighting planes, three two-seaters, ten observation and six night bombers.

Assails Director Again

A considerable part of Congressman Magee's discussion was devoted to the appointment of John D. Ryan as chairman of the Aircraft Board, and to his activities in regard to the railroads in the West, which the Congressman claimed were beneficial to interests with which Ryan was connected. He denounced the operation of the spruce production by General Disque and his employment of soldiers at a daily wage.

Congressman Lea in turn told of the vast numbers of airplane engines, airplane parts and airplane materials supplied to the Allies by this country, of the number of pilots trained, the vast numbers of airplane engines produced, the large quantities of training planes and service planes manufactured, although not shipped to the front, and the establishment of training fields both in this country and abroad for American pilots.

Semi-Trailers and Tractors Now Taxed

Treasury Decision Approved March 3 Reverses Ruling Made Last Year

NEW YORK, March 8.—The Trailer Manufacturers Association has issued the following bulletin concerning the treasury decision approved March 3, at Washington, reversing its rulings on excise taxes on sales under the revenue act of 1918.

"In revising its rulings on excise taxes on sales under the revenue act of 1918, the Commissioner of Internal Revenue, in treasury decisions 2989, approved March 3 and just issued, has reversed his rulings of last year as promulgated in regulations 47, with regard to tractors and trailers forming a semi-trailer combination.

"The revenue act itself specifically exempts tractors from taxation and nowhere mentions trailers or semi-trailers. The regulations issued last year say: 'The act specifically exempts tractors, even if sold in combination with a trailer,' and also says: 'Automobile trailers, regardless of the number of wheels which they may have, are not parts of or accessories for automobiles.'

"How completely the revenue office has reversed itself is seen by comparison of the foregoing with the new decision just issued, in which it is held that a tractor is a machine 'designed to draw or pull' but that 'tractors or semi-tractors which carry a portion of the load are taxable as automobile trucks'; that 'trailers are not taxable' but that 'so-called trailers or semi-trailers so designed that a portion of the load or weight thereof is carried or borne by the tractor or semi-tractor are taxable as parts of automobile trucks.'

Technical Points in Law

"Under the law, automobile trucks are taxable at 3 per cent and automobile parts at 5 per cent. However, the new decision states that 'an automobile truck or automobile wagon formed by joining together a so-called tractor or semi-tractor ***** and a so-called trailer or semi-trailer is taxable as a whole as an automobile truck,' that is at the rate of 3 per cent, but when the two are 'sold separately, the so-called tractor or semi-tractor is taxable as an automobile truck or automobile wagon (3 per cent) and the so-called trailer or semi-trailer as a part' (5 per cent).

"If the reader fails to follow the foregoing he should blame the mental genuflections of the interpreters of the law, which is almost as popular a favorite as the Volstead act, both made particularly pleasing by seemingly zealous endeavors to construe them so they will be easy to understand and cause as little inconvenience and annoyance as possible.

"How a machine can be a tractor and tax free when it draws a four-wheel trailer and an automobile truck and taxable at 3 per cent when it draws a semi-trailer, and how a semi-trailer can be an automobile truck when sold with a tractor and taxable at 3 per cent and an automobile part when sold separately and taxable at 5 per cent would require a Solomon to explain.

"Trailer manufacturers, relying on the regulations issued last year, have collected and paid no taxes on trailers or semi-trailers. Had they done so they would have been liable to a fine of $1,000 or imprisonment for one year, or both. Whether or not it is the intention of the Treasury Department to make the decisions of March, 1920, retroactive is not known. To do so would impose unjust hardship on the manufacturers, who cannot now collect the tax from last year's purchasers."

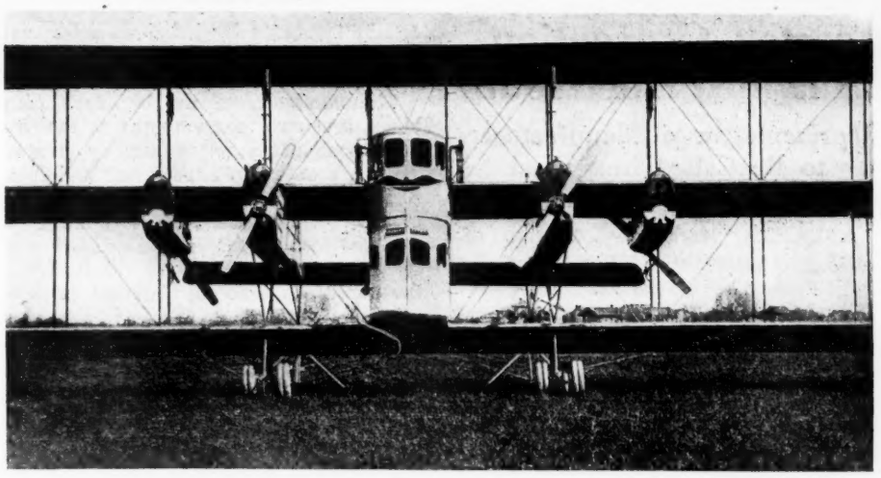


Photo by Kadel & Herbert.

Italy's New 40-Passenger Airplane

Italy's latest airplane is a double-decker. It has two fuselages and carries 40 people. This new type of machine is manufactured by the Italian Government

CHASE ACQUIRES BEEMAN

TORONTO, March 8—An important transaction in the tractor world was concluded at Toronto, Ont., this week, by which the Chase Tractors Corp. became the Canadian distributer for the Beeman tractor, manufactured by the Beeman Tractor Co. of Minneapolis. The Beeman is a one-horse tractor, designed for small farms, truck gardens, orchards, suburban homes, plantations, etc., and will be marketed by the Chase people as an auxiliary line to their Chase 9-18 tractor.

While the present arrangement is only a distributing one, the Chase Tractor Corp. will in all probability eventually manufacture the Beeman tractor at their Toronto plant. Negotiations to that end are under way.

LATEX INSTALLS CRANES

FOND DU LAC, March 8—The Latex Tire & Rubber Co. is installing at its new plant at Fond du Lac labor saving devices for the rapid handling of tires designed especially for the company by Grant Lambright, general superintendent. A system of cranes and tables is said to give one-third more speed in handling tires.

Tire Prices Back to Former Scale

Efforts by Manufacturers to Sustain Higher Costs by Production Fail

NEW YORK, March 8—A general rise in tires prices in which many leading manufacturers joined went into effect to-day. As a result of the increase tire prices are back to about the same point at which they stood before the general cut of May, 1919.

Pneumatics led with increases of 15 to 25 per cent. Solids showed increases of about 10 per cent, and slight advances were made on tubes.

Rumors of the impending advance have been current for several weeks, in fact, so far back as last October the trade was prepared for the rise, but it did not materialize. This was chiefly due to the fact that efforts have been made by many of the larger companies to maintain the present prices by increased production and intensive sales effort.

The rapidly rising cost prices, contributed to largely by the upward trend of cotton for tire fabrics, are now declared to have made an increase imperative. Although there has been no appreciable increase in the cost of crude rubber, tire fabrics have been rising steadily, the cost of cord fabrics now being quoted at a figure 150 per cent in advance of cost a year ago.

This upward trend in cotton began a few weeks after the tire prices were decreased in the spring of 1919, and it is now declared that the decrease would not have been made at that time if the conditions in the cotton market had been anticipated. The failure of the Sea Island cotton crop aggravated the situation, and several additional production cost increases, including the upward trend of wages, were contributory.

Tractor Convention Planned for South

Representatives of Manufacturers to Be Called in Special Development Session

ATLANTA, March 5—Executive officers who direct the policies of the big implement and tractor manufacturing companies of the country are to be invited to a national meeting in Atlanta some time this spring or early summer, if the present tentative plans of the newly organized Atlanta Tractor and Implement Club materialize. This club was formed a short time ago and included in its membership are about thirty of the leading implement dealers and manufacturers' branch house representatives in Atlanta.

This meeting is to be held for the purpose of proving to the implement manufacturers that an enormous demand exists in the South for modern farm machinery of all kinds, principally tractors. The depredations of the boll weevil in the cotton fields has necessitated crop diversification with the result that the South has forged to the front in the agricultural world, now producing grain products, peanuts, velvet beans, sweet potatoes, etc., in great quantities. These crops have proven so beneficial from a financial standpoint that diversification will continue, and the result is that the big demand for modern farm machinery exists.

The meeting to be arranged here will be the forerunner, it is planned, of a tractor and implement show also to be held in Atlanta, that will be one of the biggest and most important in the country. It will be discussed at this meeting and definite plans for holding it later on probably arranged.

J. W. Rawlings, manager for B. F. Avery & Sons, president of the Atlanta Tractor and Implement Club, stated that while the plans are still tentative he believed the projects would be carried out successfully this spring and summer.

Canary Islands Offer Market for Trucks

WASHINGTON, March 5—An excellent market for motor trucks exists in the Canary Islands, where thousands of tons of fruit and vegetables are hauled yearly by mule teams from plantations to ports. This work could be economically performed by motor trucks, states Consul G. K. Stiles, in a report to the Bureau of Foreign and Domestic Commerce.

There are 875 motor vehicles registered in the islands, 400 in Teneriffe and 432 in Grand Canary. Only six of these are motor trucks. There are thirty motorcycles in operation. Lacking steam railway transportation completely, the inhabitants of the island have taken promptly to the use of automobiles for passenger and freight service. These can be increased by judicious enterprise, and the motor truck business can be greatly improved.

The managers of the big fruit combines are now contemplating the replacement of mule teams by trucks. They are eager to experiment and if an American firm will place one or two trucks with bodies especially built to suit the local needs in operation, a successful demonstration will result, states the consul, in a steady increase in sales until the mule team system disappears.

There are excellent highways throughout the islands, and but few localities where bad roads or excessive grades exist.

Trade Review Gives South American Data

NEW YORK, March 6—A trade review of South America, just compiled by the Guaranty Trust Co., reveals the formation of new steamship lines, the institution of new cable facilities and other industrial features relating to that country of direct interest to the automotive exporter of the United States. The most important related to the contemplated plans for a bi-weekly service with five steamers to the East Coast of South America, from New York, to touch at Rio de Janeiro, Santos, Montevideo, and Buenos Aires. At the same time, announcement was made that W. R. Grace & Co. would institute a fortnightly service from New York to the West Coast. The line will pass through the Canal and reach Valparaiso in 18 days, stopping at Callao, Arica, Iquique and Antofagasta.

New cable lines connecting Rio de Janeiro and Santos with the existing All-American cable system at Montevideo and Buenos Aires were said to be expected in operation next month. Prompt dispatch of international telegrams was being arranged.

American car markets in both Colombia and Panama were said to be enlarging because of a good roads campaign in the former country and the tourist season in Panama. Road-making outfits, including medium sized tractors, are needed in Colombia, according to the review.

IMPORTS 10,000 TRACTORS

OTTAWA, ONT., March 5—More than 10,000 tractors were imported into Canada during 1919, according to figures furnished by the Department of Trade and Commerce. The passenger cars imported totaled 9,367 and trucks 21,113. The cars were stated to cost $9,304,235, and the trucks $3,437,464.

The exact number of tractors admitted through the customs is 10,092, valued at $10,647,557. It is interesting to note that only 317 were valued at more than $1,400.

FIRE DESTROYS DIE PLANT

MILWAUKEE, March 8.—The Milwaukee Die Casting Co., 297 Fourth Street, Milwaukee, sustained a heavy loss by fire, covered by insurance of $101,000. A plant will be provided in temporary quarters to fill orders.

British Consider Piece Work Plan

Employers and Trades Arrange Conference on Wages—Agree to 47-Hour Week

LONDON, Feb. 13.—(*Special Correspondence*)—The 47-hour week has been agreed to as a standard between the engineers' unions and the employers federation, but the question of the two-shift day or three-shift system is to be discussed. It is agreed also that semi-skilled piece-work prices are to be advanced. Payment by results is to be discussed at a special conference.

It was said the engineers' unions had decided by vote against the system of payment by results. The conference referred to is to be largely concerned with that decision, as the present agreement between the employers and the union men is about ending. The general opinion of organized labor is directly opposed to—because it is suspicious of—piece work in any form.

Employers are largely to blame for this outlook, partly because as a body they introduced it in haphazard fashion, and some of them clearly showed that they begrudged the men their earnings on the increased output, and largely, probably most of all, because of the comparative guess-work shown in the fixing of the prices.

England well remembers the introduction of the piece system, and the outcry caused by juggling with the rates. The present *impasse* is a legacy of that time, now over thirty years since, and with the large growth of socialistic ideals and outlook, it may be doubted if the British skilled workers can now be converted to accept the system.

OIL RIGHTS GRANTED

WASHINGTON, March 5—The Mexican Government is to permit certain petroleum companies to drill new wells, according to information received by the Bureau of Foreign and Domestic Commerce. La Transcontinental and the Union Oil Co. have been granted permission to drill three wells, while La Continental, the Mexican Sinclair, and the English Oil Co. are to drill one each. At the same time petroleum agents in Tampico have been authorized to grant twenty-two permits. As a result of these concessions it is evident that production will be greatly increased; in fact, two new wells are already producing.

MOZAMBIQUE CHANGES DUTY

WASHINGTON, March 5—The import duty on automobiles and accessories into Mozambique have been changed by a Government decree.

Automobiles range from 5 per cent to 10 per cent ad valorem.

Parts and accessories are at 5 per cent ad valorem.

Gasoline, from 3 per cent to 5 per cent ad valorem.

Lycoming Contracts for New Foundry

Will Have Capacity of 1200 Sets of Motor Castings a Day

WILLIAMSPORT, PA., March 5—Contracts have just been let for the erection of a large foundry for the Lycoming Foundry and Machine Co. It will be one of the largest plants in the country operating exclusively on motor castings.

About 250 tons of iron will be melted daily, permitting a production of 1000 to 1200 complete sets of castings per day. A power plant will be erected with reserve capacity for extensions of the plant. Unique features include the core room complete in a separate building connected with the foundry proper, the intervening space to be used for cooling cores after baking, eliminating the smoke.

Continuous pouring will be used on cylinders and cylinder heads and conveyors of sufficient length will be installed to permit adequate cooling of iron before shaking castings from sand to eliminate "bleeding." On completion of the new plant, the present foundry will be dismantled and converted into a machine shop.

The Lycoming company has entered into a number of large contracts with car makers recently, notable among these with the Willys interests for castings for the new 4 to be made at Elizabeth.

MOTOR OFFICIALS BACK LINE

DETROIT, March 5—The Detroit Motorbus Co. organization has been completed with the election of the following officers: R. W. Meade, president and general manager; S. D. Waldson, vice-president; Sherman D. Callender, secretary. The board of directors included H. W. Alden, of the Timken-Detroit Axle Co.; W. F. Evans, president of Standard Screw Products Co.; Major Edwin Denby, and other prominent men.

It is the plan of the company to start service on one complete bus line as soon as buses can be obtained and to extend the service as rapidly as the situation demands. Confidence in the venture is evinced by the purchase of stock at par by all of the officials and directors. No promotion stock has been issued and none will be sold at less than par.

FORMOSA POOR MARKET

WASHINGTON, March 6—There are twenty-five automobiles and three motorcycles in the city of Taihoku and two automobiles and two motor trucks in Taiwan, Formosa, according to a report from Consul Kirjassoff. Five of the cars in Taihoku are used on a bus service, being capable of seating sixteen persons each. All but one motor car, which is an Italian car used by the Government, and one English motorcycle are of American manufacture. Most of the automobiles are public conveyances.

The roads in Taihoku and its immediate vicinity are good and without steep grades. There is a road to Tansui (about 16 miles) and another to Keelung (about 18 miles), but these are narrow and with many difficult turns. For these roads cars of good "pulling" power on second and first speeds are necessary.

Although the number of automobiles is gradually increasing, there is small chance of an extensive market in the near future. Passenger cars must compete with cheap railway service, run on a fairly frequent schedule to outside points, and with the light railways which use coolie power. The great majority of the population is too poor to afford cars. Because of comparatively cheap coolie labor and the fact that Taiwan is hardly at all developed industrially, there is no great market for motor trucks here, but the sugar companies may eventually find it to their interest to use them.

Both National Shows Win Success in Kind

NEW YORK, March 5—New York and Chicago divided the honors this year in the two big shows held under the auspices of the National Automobile Chamber of Commerce.

Reports of the show committee, submitted at the N. A. C. C. meeting here yesterday, show that New York's paid attendance was considerably larger than Chicago's, but the business reported by dealers was greater in Chicago than in New York. Chicago's attendance was somewhat affected by the "flu" epidemic.

The returns to the exhibitors were the best of any of the shows under N. A. C. C. management. They were as follows:

New York Passenger Car Show: 130 per cent; New York Motor Truck Show: 88 per cent; Chicago Passenger Car Show: 72 per cent; Chicago Motor Truck Show: 75 per cent.

JACQUET BUYS FACTORY

BELDING, MICH., March 5—Jacquet Motors Corp., organized recently, expects to be in production about the middle of April. The company has purchased an ammunition factory and property adjoining, for which it paid $50,000 in cash. Machinery for automobiles is rapidly being installed, and the company is assembling and organizing its working force.

They will build a four-cylinder car with a 124-inch wheel base, and reports from the factory are to the effect that the experimental car developed 92 miles on a circular track. All of the men associated in the company are known in the industry and have been in the game in some instances for more than twenty years.

BESSEMER TRUCK TO BUILD

PHILADELPHIA, March 6—Additions to the factory property at Decatur street and the Pennsylvania Railroad tracks will be made by the Bessemer Motor Truck Co. at a cost of $48,000.

Trade with England Gains in January

Imports and Exports of Cars, Parts and Tires Show Increase

LONDON, Feb. 17—(*Special Correspondence*)—The January export of British vehicles was 204, valued at prewar rates of exchange at $655,000, and the number of chassis exported was 105, valued at $405,000. The value of exported motor car and truck parts (not tires) was $637,712, and of tires, $2,379,730.

Imported vehicles in January reached 2086, valued at $3,222,968, and chassis, 911, valued at $1,798,810. The value of imported parts (not tires) was $2,638,420, and of tires, $1,757,990. The motorcycle export value for January was $420,660; parts, $90,385; and tires, $897,730. The import value was: Motorcycles, $170,630; parts, $20,695, and tires, $1,757,990.

It will be seen that while there has been a notable increase in the total volume of trade during January, *the imports—mainly from the United States—have increased relatively much more than the export of British vehicles and chassis.*

For instance, while Great Britain exported 204 vehicles as compared with 52 in January, 1919, she imported 2086 vehicles as compared with 17 in January, 1919. Regarding the tire values, both imports and exports, it should be noted that they denote totals inclusive of cars, motorcycles and cycles, the distinctive classification having been abandoned since the beginning of this year.

Nova Scotia to Spend $58,000,000 on Highways

MONTREAL, March 5—The Nova Scotia Highway Board has selected 4000 miles of the most important highways of the province which they propose to rebuild of the very best road materials which are available and for which the province has the ability to pay. In addition to the rebuilding of these roads a large mileage of secondary roads is to be improved by the removal of rocks and ledges, and by adequate draining systems. The program of road construction and improvement calls for years of time and many millions of dollars. The announcement is made that $58,000,000 will be spent on the undertaking during the next five years.

STEWART MOTORS FORMED

BOWLING GREEN, OHIO, March 8—The Stewart Motor Car Co. has been chartered with a capital of $500,000 to manufacture and sell a line of passenger cars. The company will take over the plant of a former motor truck concern. The incorporators are Y. Frank Stewart, Charles H. Gifford, Irene Barringer, Willis Garnes and C. S. Hatfield.

Part Time Students to Meet Labor Need

New Texas Truck Company Will Finance Education to Get Assistance

AUSTIN, TEX., March 8—D. J. Woodward of San Antonio and associates have purchased the former radio aviation school and tract of 60 acres at Austin and are organizing a company to convert the establishment into one of the largest motor truck body manufacturing plants in the South. The property is known as Penn Field. The buildings now located upon the land were erected by the University of Texas for the War Department at a cost of $187,000. They are of brick construction and are equipped with water, electric light and power and modern sewerage. A spur railroad track gives them a transportation outlet.

Woodward says that the company which is now being formed will have a capital stock of $500,000. No stock will be sold to outsiders. It is the purpose of the new company to solve the labor problem by utilizing to a great extent the spare time of the students at the University of Texas. Realizing that there are hundreds of students compelled to work their way through college, the new company plans to give all who desire to take advantage of the offer board, lodging and laundry for a certain part of their time each day. One of the five buildings will be set aside for housing those who take up spare time work at the plant, and the company plans to furnish transportation to and from the university.

"This is in no way a philanthropic plan," said Woodward. "It is simply a new feature of modern industry and we plan to utilize the tremendous manpower of the student body that would otherwise go to waste. At the same time this plan gives the young men of the state a chance to earn their way through college and learn a useful trade while acquiring university knowledge."

TO MAKE VACUUM CARBURETER

HOLYOKE, MASS., March 6—For the manufacture of a vacuum carbureter for automobiles the newly incorporated Burr Appliance Co., with capital stock of $250,000, is to build a modern plant here immediately. Charles F. Munder of Springfield is president, Charles D. Heywood, treasurer, and with Russell L. Davenport of this city they compose the board of directors. The capital stock is divided into 15,000 shares of common stock at $10 a share and 1000 shares of preferred stock at $100 a share.

NEW DROP FORGE COMPANY

MILWAUKEE, March 8—The Interstate Drop Forge Co. of Milwaukee, a new $250,000 corporation organized to manufacture commercial drop forgings for the automotive and machinery industries, has broken ground for a new forge and machine shop group costing $200,000. Officers of the company have been elected as follows: President, William C. Frye; vice-president and general manager, Major Sherman M. McFedries; secretary-treasurer, C. R. Messinger; directors, Edgar L. Wood, B. Fleeger and J. M. Olmstead, Chicago. Frye is president of Chain Belt Co. and secretary of Sivyer Steel Casting Co., Milwaukee. Major McFedries formerly was sales-manager, Cutler-Hammer Mfg. Co., later taking charge of production for the Ordnance Corps in the Wisconsin district. Messinger is vice-president and general manager, Chain Belt Co. and Sivyer Steel Casting Co. Olmstead is a member of the Electric Steel Co., Chicago.

930 Sales at Round-Up

LA CROSSE, WIS., March 8.—Five hundred La Crosse tractors and 430 plows were purchased at the annual 3-day round-up of western distributers and dealers of the La Crosse Tractor Co., held at the factory in La Crosse, Wis. Of the orders placed, 156 tractors and 113 plows were for immediate delivery. All except nine of the visiting distributers and dealers signed contracts and placed orders for 1920.

Stutz to Issue 20,000 Shares of New Stock

INDIANAPOLIS, March 9—Authority for an increase in the capital stock of the Stutz Motor Car Co. of America, Inc., from 100,000 to 120,000 shares, will be sought at a meeting of stockholders set for March 26. A stock dividend of one-fifth of a share has been declared and will be payable April 15 to stock of record April 5, if approved at the stockholders' meeting.

Net profits for the year ended Dec. 31, 1919, were $997,148, equivalent to $9.97 a share on the 100,000 shares of outstanding stock of no par value. This compares with earnings of $594,047 or $7.92 a share on the 75,000 outstanding shares in 1918.

FORT WAYNE PLANT BUSY

FORT WAYNE, IND., March 8—Another entry into the automobile tube manufacturing business is the Fort Wayne Tire & Rubber Manufacturing Co. of Fort Wayne. This concern is a purely Fort Wayne enterprise and has erected and is now occupying a modern factory building on Jacobs Avenue. It has just begun operations, and in recent advertisements has this to say about itself: "We are now manufacturing Wayne Supertested Red and Gray Auto Tubes in our new plant at the rate of 200 a day, consequently it is now possible to supply some of the demand that exists and will be created for these tubes."

FORMS REBUILDING COMPANY

COLUMBUS, OHIO, March 6—The Case Automotive Rebuilding Co. has been chartered with a capital of $102,500 by A. A. Case, E. S. Shank, T. McDd. Hills, T. E. Franch and C. E. Steeb.

Southern Highways to Cost $25,000,000

Federal Aid in Sixteen Southern States Is Apportioned—Texas Leads in Mileage

ATLANTA, March 8—Good road projects in the sixteen Southern states already in progress or ready for construction to begin in the near future, will cost almost $25,000,000, according to official estimates of the Bureau of Roads of the Department of Agriculture, recently announced. It is estimated that these projects call for the construction or improvement of 2671 miles of roads in the South.

These figures include only those projects ready for actual work to begin, and there are several other road improvement projects that have been agreed upon between the State and Federal governments that are not included in these totals. This will serve to swell the total cost to a much larger figure and also total mileage.

Georgia leads in total mileage in the Southeast, with 307 miles to cost $1,725,798, and ranks second among all the states of the South. Texas leads the South because of its immense size, with a total mileage of 607, calling for an expenditure of $3,508,278. North Carolina is third, total mileage 255, estimated cost $1,716,100; Louisiana is fourth, total mileage 248, estimated cost $2,037,244; Alabama is fifth, total mileage 240, estimated cost $1,053,587.

Hercules Expands; to Make Own Castings

CANTON, OHIO, March 8—The capital stock of the Hercules Motor Mfg. Co. has been raised from $800,000 to $1,500,000, all common stock, to permit the carrying out of plans for greatly increased production. The following officers were elected: J. G. Obermier, president; Gordon M. Mather, vice-president; Charles Balough, secretary, treasurer and general manager; H. H. Timken, chairman of board; Rathburn Fuller, R. W. Gallagher and Austin Lynch, members of the board of directors.

A separate company, known as the Motor Castings Co., has recently been formed to furnish castings for Hercules engines. The demand for the heavy duty type engines which the Hercules company builds has been heavy. With completion of the present plans the increased production will enable the company to catch up with the demand

FULLER FOUNDRY IN SWING

KALAMAZOO, MICH., March 6—Fuller & Sons Mfg. Co., forced by shortage of gray iron castings to equip their own foundry, poured the first run of iron Feb. 27, three days ahead of schedule, and the foundry now is in full operation. The new addition is equipped with the latest type of foundry machinery, and is in charge of a practical foundry man of long experience. All modern devices for an efficient foundry have been installed.

Packard Accepts Canadian Exchange

Notifies Agents Funds Will Not Only Be Taken But Reinvested There

TORONTO, March 4.—The Packard Motor Car Co. has notified its Canadian distributers, the Ontario Motor Car Co., Ltd., that not only will they accept Canadian funds at par on the purchase of Packard cars, but also will invest such funds in Canada.

Stewart-Warner Speedometer Corporation has notified its Canadian distributer, Donald Johnston of Toronto, who has branches in Montreal and Winnipeg, that they will absorb 50 per cent of the exchange on specialties sold in Canada.

The Canadian distributers of the Liberty Motor Car Co., the Premier Motor Sales of Toronto, announce that the Liberty company has been accepting the Canadian dollar at 100 cents on the American dollar right along and investing Canadian funds in Canadian securities.

Belmont Motors Seeks More Working Capital

HARRISBURG, Pa., March 6.—At a meeting of the stockholders of the Belmont Motors Corp. held in the executive offices in Harrisburg, Pa., action was taken directing the corporation officials to enter into negotiations with the Fidelity Investments Co. looking to the sale, to that company, of all that now remains unsold of the authorizod $1,000,000 of preferred stock of the corporation. Wm. G. Hamilton, of the Fidelity Investments Co., says that in the event of successful negotiations with the corporation, there will be put into effect at once a plan to have the plant of the Belmont corporation at Lewistown, Pa., turn out trucks in large numbers within a short time. The plant there now is operating on a limited capacity basis and it is intended, should the deal go through, to produce twenty trucks every day, giving employment to 400 hands, many of whom would be skilled workmen.

CANTON RIM TO ENLARGE

CANTON, OHIO, March 6—To carry out a policy of enlarging the factory and to provide more facilities, steps have been taken by the Canton Rim Co. to increase its authorized capital from $100,000 to $500,000.

GOODRICH EARNS $17,304,813

AKRON, OHIO, Mar. 6.—B. F. Goodrich Co., in its annual report as of Dec. 31, shows net profit after charges, but before Federal taxes, of $17,304,813, equivalent after deduction of preferred dividends to $25 a share on the $60,000,000 common stock of $100 par value, compared with $23.08 the preceding year.

Stockholders will be given opportunity March 10 to vote on the issuance of $30,000,000, 7 per cent convertible gold notes due in 5 years. In addition, the common stock is to be increased from 600,000 shares of $100 par value to 1,500,000 shares of no par value. Of this amount 600,000 shares will be exchanged share for share for the present stock; 125,000 shares will be set aside for employees; 375,000 shares will be reserved for issue, and the 400,000 will be available for future requirements.

Common stockholders will have the right to purchase at the rate of $100 of notes for each two shares of common stock held, at the price of $99 for each $100 note, or they can purchase new common stock at the rate of one and a quarter shares for each two shares of old stock at the rate of $80 a share.

Financial Notes

The Kelly-Springfield Tire Co. reports gross profits on sales of $7,034,284 for the year ended Dec. 31, 1919, as against $7,187,834 in 1918, and a surplus active dividend of $1,665,380 as against $3,374,116 the previous year. The balance sheet of Dec. 31 shows cash in bank and on hand of $1,679,946. Accounts receivable, $1,970,441; notes receivable, $63,586; inventory, $7,073,642; accounts payable, $351,652, and a total asset and liability of $23,796,029.

The Pennsylvania Rubber Co. will pay the regular quarterly dividend of 1¾ per cent on preferred stock and 1½ per cent on common stock March 31 to stockholders of record March 15.

The Pierce Arrow Motor Car Co. has declared the customary dividend of 2 per cent on preferred stock, payable April 1 to stockholders of record March 15.

Mason Tire Co. and the Mason Cotton Fabrics Co. have submitted a consolidation plan, which will be voted on by stockholders March 31. The plan contemplates a capital increase from $5,000,000 to $10,000,000, all of which will be 7 per cent cumulative preferred stock. Stockholders have been advised of the plan and the ratio for the exchange of stock.

The William Small Co., Indianapolis, has increased its capital stock from $1,000,000 to $3,000,000 and plans a production of 200 cars daily.

Oak Tire & Rubber Co. report earnings in 1919 at nearly 11 per cent on the $350,965 capital stock outstanding.

Peerless Truck & Motor Corp. has declared an extra dividend of ½ per cent on the stock along with the regular quarterly dividend of 1½ per cent, both payable April 1, to stock of record March 1.

The Winton Co., in a balance sheet as of Jan. 13, shows a profit and loan surplus of $2,266,605, as compared with $2,094,986 in 1919.

Standard Parts Gets Loan of $6,000,000

Cleveland and New York Banking Houses Advance New Working Capital

CLEVELAND, March 6.—Additional capital requirements of the Standard Parts Co. are provided in a loan of $6,000,000, the arrangement for which has just been announced in Cleveland. Five of the foremost Cleveland banks and the Chase National of New York, together with Otis & Co. and Borton & Borton, investment security houses of Cleveland, are behind the big parts concern in this financing.

At the annual meeting of the company, officers were elected as follows: President, J. O. Eaton; vice-presidents, E. J. Hess, John Younger, Dan C. Swander; secretary, P. A. Connolly; assistant secretary, R. C. Hyatt; treasurer, T. E Borton. The directorate also includes C. I. Ochs, Maynard H. Murch, F. R. White, H. P. McIntosh, Sr., W. H. Prescott, W. E. Bock, C. S. Eaton, T. H. Jones.

Willys Corporation Has 1919 Profits of $5,364,683

NEW YORK, March 4.—Total profits of $5,364,683 before dividends and taxes are shown in the report of the Willys Corp. for the year ended Dec. 31, 1919, the figures covering operations of the constituent companies for the first six months to July 1, the date of the original balance sheet, and for six months after.

Balance after dividends, taxes, etc., was $3,250,800. Total assets after deducting all liabilities and reserves, including taxes, were $51,185,618.

The corporation has orders and contracts booked which will strain the capacities of its established plants, according to the report to the stockholders of J. R. Harbeck, vice-president.

LANSING TRIPLES CAPITAL

LANSING, MICH., Mar. 6.—The Michigan Securities Commission has approved a new stock issue of the Lansing Stamping and Tool Co. from $100,000 to $300,000. Of this amount $50,000 worth of the stock is 7 per cent preferred, the remainder common. The company has on its books a half million dollars worth of business contracted for since Jan. 1, and negotiations are in progress on a contract that will bring the 1920 business to $1,000,000.

LANGSTADT ADDS TO CAPITAL

APPLETON, WIS., March 8 — The Langstadt-Meyer Co. of Appleton, Wis., a large electrical contracting concern which in the pasttwo years has developed a successful farm lighting plant and self-contained generating plants for the army, has increased its capital stock from $50,000 to $400,000.

Holmes Reorganizes and Plans Expansion

CANTON, OHIO, March 6—To meet the growing demand for the air-cooled automobile, the Holmes Automobile Co. has reorganized and selected Frank H. Golding, four years vice-president and general manager of the Ohio Power Co., as general manager. Expansion of the local concern will commence April 1, when Golding assumes charge.

The directorate re-elected follows: Arthur Holmes, C. H. Rockwell, George W. Belden, W. C Laiblin, and Clarence G. Herbruck, all of Canton; Fred H. Snyder, Massillon, and R. S. Suydam, of Pittsburgh. Officers elected at the meeting were: Arthur Holmes, president and treasurer; C. H. Rockwell, vice-president; F. H. Golding, general manager, and George W. Belden, secretary.

Reports for the year show the company has already changed from 100 per cent war basis to a 100 per cent automobile business, notwithstanding the recent coal and steel strikes and freight embargo. The books show unfilled orders for approximately $1,000,000 worth of cars.

TAKE OVER TRACTOR COMPANY

CHARLES CITY, IOWA, March 5—The plant and business formerly conducted by the American Engine and Tractor Co. in this city have been been taken over by a new concern to be known as the American Tractor and Foundry Co., a South Dakota corporation with a capital stock of $500,000. Some of the members of the old concern are also active in the new corporation, so that what has really taken place is a reorganization by which new capital has been made available. The plant occupied consists of two spacious brick buildings alongside the Illinois Central tracks about half a mile from the town limits.

A farm tractor was developed by the old company and about half a dozen machines had been built when the outbreak of the war made a continuation of the work impossible. The new concern plans to specialize on a farm lighting plant of 1.5 kw. output comprising a Westinghouse generator and an engine of the company's own manufacture. A line of stationary farm engines will also be built and it is the intention later to take up the manufacture of farm tractors, using the model already developed. Application has been made for the registration of the trade name "Americo." A yearly production of 5000 lighting sets is contemplated and deliveries will begin in April. W. L. Joyce is president and H. L. Laird secretary of the new corporation.

UNION STEEL BUYS PARKER

ALBION, MICH., March 5—The Union Steel Products Co. has purchased the plant and business of the Parker Collapsible Rim Corp. of Chicago, and will move the machinery to this city at once. The new plant will furnish employment for 500 men.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

Du Pont Completes Organization Plans

WILMINGTON, DEL., March 5 — Du Pont Motors, Inc., has been formed in this city to succeed the Du Pont Motor Mfg. Corp., and has announced the acquisition of the Delaware Marine Motors Co., of Wilmington. The capitalization of the company has been increased to $1,500,000, 7 per cent preferred, and 30,000 shares of common at no par value.

The company will manufacture the Du Pont automobile and also the Du Pont marine engine. In connection with the acquiring of the assets of the Delaware Marine Motors Co., it is said this plant will probably be discontinued with the location of the Du Pont company on a site near Philadelphia.

Officers of the Du Pont company are: E. P. Du Pont, president; A. M. Maris, vice-president and general manager; Parke Ross, treasurer, and C. B. Bishop, secretary.

ENTERS AUTOMOTIVE FIELD

CHICAGO, March 5 — The Brassco Manufacturing Co., which has been engaged here for some years in making metal store fronts, will manufacture a line of drawn or rolled mouldings and shapes for the automotive industry. Included in the line will be windshield tubing, bumpers, drip drains, angles, channels, and similar metal items. The company stated that it was prepared to undertake such work in any metal.

ORLEANS TRUCK GETS SITE

NEW ORLEANS, March 5—The New Orleans Truck Manufacturing Co., of which E. C. Patton is president, has purchased a "daylight" factory building, at Tchoupitoulas and Belmont Streets, for $53,000. The building is 76x140 ft. and is considered the largest truscon steel factory building in the South. Machinery is being installed and 300 trucks contracted for on the basis of the first truck, now in operation, built by Mr. Patton in a private shop.

TO MAKE PISTON RINGS

ROCKFORD, ILL., March 4—The Universal Piston Ring Co., Rockford, Ill., has been incorporated with capital stock of $100,000 and will manufacture its product at 1026 Charles Street until permanent quarters are secured. Officers have been elected as follows: President, William Stenlund; vice-president, G. W. Hamlin; secretary, Richard F. Clapp; treasurer, W. P. Burdick; manager, W. G. Burdick.

Bacon Motors to Build Two Additional Units

PHILADELPHIA, March 5 — Bacon Motors Corp. is planning the erection of two additional automobile factory buildings and a large office building on its 21-acre tract in New Castle, Pa. One factory building, recently completed, has begun manufacturing operations.

The additional structures will be a large shop for the making of automobile motors; a three-story building, 600 x 50 ft. for a body-building, upholstering and painting plant, and the office building, which will provide facilities for the officers of the corporation and the superintendents of the various departments. There will be a cafeteria for employees.

It is intended by the corporation to be on a small producing basis by May of the present year and by October, it is planned to have a daily output of twenty-five cars, the product to be: Five-passenger touring cars, two-passenger sports model roadsters, four passenger coupes and five-passenger sedans. All bodies will be installed on chasses of the same model.

The program calls for a duplicating system within two years, to make the annual output of the factory 15,000 cars. The company will be capitalized at $2,000,000, according to announcement.

SUPERIOR TRUCK TO BUILD

ATLANTA, March 5—A modern plant for the manufacture of automobile trucks will be constructed at Wells Street and the Southern Railway in Atlanta by the Superior Motor Truck Co., manufacturers of Superior trucks. Actual construction work will start in the near future, it was announced, much of the building material being already on hand.

The company's present plant on Stewart avenue was sold a few days ago for $65,000 to the K. L. Jones Machinery Co. by E. M. and E. G. Willingham, owners of the Superior Truck Co. The present plant provides about 25,000 sq. ft. of floor space, while the new plant, on a site providing 65,000 sq. ft., will serve to almost triple the capacity of the present plant.

MADISON LOCATES OFFICES

NEW YORK, March 5—The Madison Tire & Rubber Co., Inc., will move from its present quarters, 254 West Fifty-seventh Street, to its own building, 20 West Sixtieth Street, about May 1. This company has also purchased in Boston a three-story building on Boylston Street, which is to be used as the New England headquarters. Arrangements have been made to open branch offices in Chicago and Philadelphia. In addition to this there will be warehouses in each of these localities.

GRIFFIN PLANS IOWA PLANT

COUNCIL BLUFFS, IOWA, March 5—The Griffin Wheel Co. is planning the erection of a $2,000,000 factory in this city.

May Form Pittsburgh Division of S. A. E.

PHILADELPHIA, March 5—About fifty members of the Pennsylvania Section of the Society of Automotive Engineers held their regular monthly meeting at Pittsburgh of Feb. 28; something like half of the total number making the trip from Philadelphia and other eastern points. During the morning a trip of inspection to the Braeburn Steel Co. plant at Braeburn, Pa., was made and a buffet lunch was served by the company at noon.

After the return to Pittsburgh, a professional session was held in the afternoon at the Pittsburgh Chamber of Commerce. J. M. Schoonmaker of Pittsburgh, who was formerly connected with the Dayton-Wright Airplane Co., gave an instructive talk, illustrated with moving pictures, on airplane quantity production at Dayton during the war. A banquet at the William Penn Hotel, and a theater party later in the evening, were other features of this meeting.

In view of the large number of automotive engineers now located in the Pittsburgh district, the formation of a Pittsburgh or Western Pennsylvania Division of the Pennsylvania Section of the S. A. E. is now being considered.

LAMBERT TIRE MAKES PLANS

BARBERTON, OHIO, March 4—Changes in the organization of the Lambert Tire & Rubber Co. have been effected simultaneously with improvements looking to doubled production in the plant. H. H. Lambert has been re-elected president; Judge Arthur Langwith, vice-president and chairman of the board of directors; N. W. Coyle, vice-president and director, and Porter E. Ramsey, a director and general superintendent of the factory. J. H. Hausan has been re-elected secretary-treasurer and also temporarily replaces G. K. Fargo as general manager.

OPEN ENGINEERING OFFICES

NEW YORK, March 6—Charles M. Manly and C. B. Veal have established offices at 250 West Fifty-fourth Street, as industrial engineers, specializing in the co-ordination of engineering and manufacturing requirements in the design production and operation of automotive power plants and vehicles.

PLOW DESIGNER DIES

DALLAS, TEX., March 6—William Sobey, former vice-president of the J. I. Case Plow Works Co., who died here recently, was for fifty years connected with the farm implement business. In the course of his career he designed thirty improvements which are in use to-day.

CYCLOMOBILE PRODUCTION

TOLEDO, March 5—Charles F. Hamel, president of the Cyclomobile Mfg. Co., said the company would begin production April 1. Financing of the company by public subscription is about completed, he said.

Men of the Industry

Changes in Personnel and Position

I. D. Cross, who has been representing the Northwestern Chemical Co., of Marietta, Ohio, manufacturers of Norwesco "chemically correct utilities" in the Western states, has been made Western sales supervisor.

G. H. Ford has been appointed salesmanager of the H. C. S. Motor Car Co.

M. S. Cooper, formerly of the sales department of Willys-Overland, Inc., has been appointed salesmanager of the Keystone Motor Truck Corp. of this city. He formerly was in charge of the commercial car division of the sales department of the Overland company.

Horace A. Brown, Jr., who has been identified with the Hyatt Roller Bearing Co., for the past nineteen years, has been promoted to managership of motor bearing division, located at Detroit.

F. W. Ramey has been appointed advertising manager of the Cotta Company, manufacturers of transmissions.

H. B. Dinneen has been appointed trade manager of the Moline Plow Co., Moline, Ill.

R. V. Kendall has been appointed vice-president in charge of production for the Mull Wood Work Co., manufacturers of steering wheel rims. He formerly was production engineer for the Cadillac Motor Car Co.

SALES AGENT OPENS OFFICE

NEW YORK, March 9—Horace H. Eckhouse, who was formerly with the B-E Motor Engineering Co. at 50 East Forty-second Street, has entered business for himself at 1834 Broadway as a manufacturer's representative, opening up about March 1. His lines include the product of the K. E. Lamp Co., Cincinnati, Duplex Machine Co., Newark, and the Melotone Warning Signal and the Duplex Double Spring Bumper for Fords and Overlands and a new timer made by the Recto Mfg. Co., Cincinnati, and also a line of las-stik-tube patches.

MURRAY BUYS WIRE PLANT

DETROIT, March 5—J. W. Murray Mfg. Co. has purchased the plant of the General Spring & Wire Co. for $200,000. The plant was purchased from the L. A. Young interests, which controlled the property.

The Murray company has announced an extra dividend of 5 per cent, payable to stockholders March 15. The company estimates gross sales for the fiscal year between $5,000,000 and $6,000,000. The Murray-Ohio Co., a subsidiary, is expected to do a gross business of approximately $1,000,000.

Horace E. Dodge New Director of N. A. C. C.

NEW YORK, March 4—Horace E. Dodge was elected to the Board of Directors of the National Automobile Chamber of Commerce to-day to fill the vacancy caused by the death of his brother, John F. Dodge.

The members adopted resolutions of sympathy to the family, expressing also the industry's sense of loss.

John F. Dodge died in New York from an attack of pneumonia which followed a cold contracted while attending the New York show.

Jones New President of Republic Rubber

AKRON, OHIO, March 4—Guy E. Norwood, former secretary of B. F. Goodrich Co., tendered his resignation as president of the Republic Rubber Co. of Youngstown. He will remain as director of the company.

E. F. Jones, formerly of the Elyria Iron & Steel Co., was elected to succeed Norwood. The latter has been in charge of the Republic since June, 1917.

PACKARD GETS LIBRARIAN

NEW YORK, March 4—Dorsey W. Hyde, Jr., has resigned as librarian of the New York Municipal Reference Library to accept a position as chief of the motor truck research bureau of the Packard Motor Car Co. of Detroit. The bureau will be a new development of the company's service aiming at the collection and classification of all data pertaining to transportation problems and their solution.

NEW OFFICERS CHOSEN

BARBERTON, OHIO, March 6—New officers of the Rubber Products Co., chosen at a recent meeting of directors, are J. W. Blaser, treasurer and director of sales; W. S. Dellett, sales manager succeeding Edward S. Babcox, and H. P. Harding, eastern district manager. The company makes the Stronghold tires and tubes. A 200 per cent increase in sales is planned for 1920.

TEMPLAR REORGANIZES

CLEVELAND, March 6—The Templar Motors Co. has been incorporated with a capital of $10,000,000 to take over the Templar plant in carrying out the reorganization scheme. The incorporators are M. F. Bramley, J. H. Orgill, W. O. Cooper, A. M. Dean and D. C. Reed.

TO SELL WINTONS ABROAD

DETROIT, March 4—Samuel A. Wallace, Ford distributer in London, England, while in Detroit this week, announced that W. E. Burlock, who is associated with Wallace in several English enterprises, would handle Winton distribution in the United Kingdom. Burlock also is negotiating for London distribution of the Columbia.

Calendar

SHOWS

Mar. 12-20—Boston, Mass. Annual Automobile Show. Mechanics' Building.

Mar. 15-20—Great Falls, Mont. Automobile Show. Montana Automobile Distributors' Association.

Mar. 20-27—Trenton, N. J. Annual Automobile Show. Armory. Trenton Automobile Dealers' Assn. John L. Brock, Manager.

Mar. 20-27—Pittsburgh. Motor Square Garden. Automotive Association, Inc. John J. Bell, Manager.

Mar. 22-27—Duluth, Minn. Automobile Show. Duluth Auto Trades Assn. W. F. Daly, Director.

Mar. 22-27—Utica, N. Y. Annual Automobile Show, Utica Motor Dealers' Association.

Mar. 22-27 — Oklahoma City, Okla. Annual Automobile Show. Oklahoma City Motor Car Dealers' Assn. G. W. Woods, Manager.

April 21-28—San Francisco. National Aeronautic Exposition. Exposition Auditorium.

Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.

FOREIGN SHOWS

April or May—London, England. Commercial Vehicle Exhibition. Olympia.

April 3-May 4—Buenos Aires. Exposition of U. S. manufacturers.

May 15-June 13 — Cars, Parts and Accessories. Antwerp.

June 26-July 25 — Commercial vehicles, tractors, camions and engines. Antwerp.

July—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.

Aug. 7-Sept. 15 — Motorcycles, sidecars, etc. Antwerp.

CONTESTS

August, 1920—Paris, France, Grand Prix Race. Sporting Commission Automobile Club of France.

June, 1920—Omaha, Neb. Reliability Truck Tour.

CONVENTIONS

May 9-12—Independent American Petroleum Congress, Congress Hotel, Chicago.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

S. A. E. MEETINGS

Mar. 23—Buffalo Section Meeting.

Mar. 25—Pennsylvania Section Meeting. Subject — High Speed at Great Altitudes, Com. H. C. Richardson, U. S. N.

April 7—Minneapolis Section Meeting. Subject—Tractor Weight and Drawbar Pulls.

Trade Opportunities in Foreign Markets

WASHINGTON, March 6. — The Bureau of Foreign and Domestic Commerce, Department of Commerce, has received requests for automobiles or parts agencies of business from individuals and companies in foreign countries. These are listed below. For further information addre s the Bureau of Foreign and Domestic Commerce and specify the Foreign Trade Opportunity Number.

A merchant firm in England desires to secure an agency for the sale of automobile lamps and horns, the horns to be preferably of the bulb type. References. 32149.

The owner of extensive forests in Manchuria desires to communicate with manufacturers of tractors. 32155.

A commercial agent in Italy desires to secure an agency for the sale of pneumatics, automobile and motorcycle accessories. Quotations should be given c.i.f. Genoa or Naples. Payment against documents. Correspondence may be in English. References. 32162.

An American firm maintaining offices in Mexico, Brazil, Argentina, Berlin and Paris desires to secure agencies for the sale of machinery, automobiles, motor trucks and tractors. References. 32185.

An American firm of manufacturers' agents, having a branch house in the Philippine Islands and being general distributors throughout the Orient, desires to secure exclusive agencies from manufacturers of carburetors and other appliances for automobiles. References. 32176.

A commercial agent in Italy desires to secure an agency for the sale of automobiles and accessories. Correspondence should be in Italian or French. References. 32179.

EISEMANN GETS CONTRACTS

NEW YORK, March 8—The Eisemann Magneto Corp. has received a contract for magnetos for the Dixie Flyer, built by the Kentucky Wagon Mfg. Co., Louisville, Ky. This company has used Eisemann ignition as standard equipment on its trucks for some time.

It has also received a contract from the Maccar Truck Co., Scranton, Pa., covering a period of 13 months.

The Eisemann corp. has opened a new sub-station at Washington, D. C.—the Auto Electric Service Co. This station is a sub-station of the Automotive Engineering Co. of Baltimore, Md., official service representative.

Recent contracts for magnetos have been signed with the following companies: Superior Motor Truck Co., Atlanta, and the Commerce Motor Truck Co., Detroit.

PISTON RING EXPANDER MADE

MADISON, WIS, March 8 — Orvey Johnson of Madison, Wis., inventor and patentee of a piston ring expanding device for automotive shops and garages, is entering upon a large production which will be marketed from Madison by the Johnson Specialty Co., 616 East Washington Avenue. Large orders for the tool have been booked. For the present it will be made under contract with Madison metal-working shops. Later, Mr. Johnson will establish a factory of his own.

LOCK COMPANY ORGANIZED

EAU CLAIRE, WIS., March 8.—The Eau Claire Auto Lock & Novelty Co. has been organized at Eau Claire, Wis., with a capital stock of $20,000 to manufacture patented locking devices for motor vehicles and a line of specialties and novelties. The incorporators are Samuel S. Swan, James Forest, Ben. A. Hanch and Frank J. Zivney.

ABRASIVE FIRM TO BUILD

WAUSAU, WIS., March 8.—The Wausau (Wis.) Abrasives Co. will build a new factory, 60 x 200 feet, to increase its output of brasives, sandpaper, etc. J. K. Sawyer is general manager.

Herschell-Spillman Plans 100,000 Output

NEW YORK, March 8—The Herschell-Spillman Motor Co. of North Tonawanda, N. Y., has started quantity production of its new Model 1100—3¼ x 5 six cylinder engine and deliveries started in March with sufficient material on hand to assure the full quantity scheduled for that and several succeeding months. Contracts for material necessary to 1920 production have been placed.

The demand for the firm's Model 7000—3½ x 5 four-cylinder engine, and the new Model 11000—3¼ x 5 six-cylinder engine, has necessitated the elimination of all other sizes and types. A manufacturing program requiring a minimum of 60,000 engines for delivery prior to Dec. 31, 1920, has been set.

To assist in the fulfillment of this schedule a large concrete, steel and brick addition, four stories in height, 70 x 160 ft., has been completed recently and new machinery of modern design and construction, valued at more than $500,000, is being installed as rapidly as possible so that the daily combined production of the two engines will, within the next few weeks, amount to more than 60,000 engines, or an annual output valued at more than $10,000,000.

A contract has been let for a second addition, involving an outlay of $175,000. This will permit of increasing the yearly output by 40,000 engines, thus bringing the yearly total up to 100,000 engines to be divided proportionately between the four cylinder and six cylinder models.

MAGNETIC EXPANDS PLANT

MILWAUKEE, March 8—The Magnetic Mfg. Co., 764 Windlake Avenue, Milwaukee, is erecting a new plant, 60 x 150 ft. It makes magnetic separators for smelters, foundries and other metal-working shops and will increase its output 300 per cent by May 1. R. H. Stearns is president.